APPENDIX E

SOURCE 3 SCORING

SOURCE 3 SCORESHEETS
ISLAND LANDFILL

WORKSHEET FOR COMPUTING HRS SITE SCORE
68th STREET DUMP
SOURCE 3

		S	S^2
1.	Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	NS	
2a.	Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	100	10,000
2b.	Ground Water to Surface-water Migration Component (from Table 4-25, line 28)	NS	
2c.	Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	100	10,000
3.	Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22)	NS	
4.	Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	NS	
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		10,000
6.	**HRS Site Score** Divide the value on line 5 by four and take the square root		50.00

NS = Not scored

TABLE 4-1

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
68th STREET DUMP
SOURCE 3

	Factor Categories and Factors	Maximum Value	Value Assigned
	Drinking Water Threat		
	Likelihood of Release		
1.	Observed Release	550	550
2.	Potential to Release by Overland Flow		
	2a. Containment	10	---
	2b. Runoff	25	---
	2c. Distance to Surface Water	25	---
	2d. Potential to Release by Overland Flow [lines 2a x (2b +2c)] 500	---	
3.	Potential to Release by Flood		
	3a. Containment (Flood)	10	---
	3b. Flood Frequency	50	---
	3c. Potential to Release by Flood [lines 3a x 3b]	500	---
4.	Potential to Release [lines 2d + 3c, subject to a maximum of 500]	500	---
5.	Likelihood of Release [higher of lines 1 and 4]	550	550
	Waste Characteristics		
6.	Toxicity/Persistence	a	10,000
7.	Hazardous Waste Quantity	a	100
8.	Waste Characteristics	100	32
	Targets		
9.	Nearest Intake	50	0
10.	Population		
	10a. Level I Concentrations	b	0
	10b. Level II Concentrations	b	0
	10c. Potential Contamination	b	0
	10d. Population [lines 10a + 10b + 10c]	b	0
11.	Resources	5	0
12.	Targets [lines 9 + 10d + 11]	b	0
	Drinking Water Threat Score		
13.	Drinking Water Threat Score [(lines 5 x 8 x 12)/82,500, subject to a maximum of 100]	100	0

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT
SCORESHEET (Continued)
68th STREET DUMP
SOURCE 3

Factor Categories and Factors Assigned		Maximum Value	Value Assigned
Human Food Chain Threat			
	Likelihood of Release		
14.	Likelihood of Release [same value as line 5]	550	550
	Waste Characteristics		
15.	Toxicity/Persistence/Bioaccumulation	a	5×10^8
16.	Hazardous Waste Quantity	a	100
17.	Waste Characteristics	1,000	1,000
	Targets		
18.	Food Chain Individual	50	45
19.	Population		
	19a. Level I Concentrations	b	0
	19b. Level II Concentrations	b	0.03
	19c. Potential Human Food Chain Contamination	b	–
	19d. Population [lines 19a + 19b + 19c]	b	0.03
20.	Targets [lines 18 + 19d]	b	45.03
	Human Food Chain Threat Score		
21.	Human Food Chain Threat Score [(lines 14 x 17 x 20)/82,500, subject to a maximum of 100]	100	100

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT
SCORESHEET (Continued)
68TH STREET DUMP
SOURCE 3

Factor Categories and Factors Assigned			Maximum Value	Value Assigned
Environmental Threat				
	Likelihood of Release			
22.	Likelihood of Release			
	[same value as line 5]		550	550
	Waste Characteristics			
23.	Ecosystem Toxicity/Persistence/Bioaccumulation		a	5×10^8
24.	Hazardous Waste Quantity		a	100
25.	Waste Characteristics		1,000	320
	Targets			
26.	Sensitive Environments			
	26a.	Level I Concentrations	b	0
	26b.	Level II Concentrations	b	25
	26c.	Potential Contamination		b
0.0065				
	26d.	Sensitive Environments [lines 26a + 26b + 26c]	b	
27.	Targets [value from line 26d]		b	25.01
	Environmental Threat Score			
28.	Environmental Threat Score [(lines 22 x 25 x 27)/82,500, subject to a maximum of 60]		60	53.35
	Surface Water Overland/Flood Migration Component Score for a Watershed			
29.	Watershed Score[c] [lines 13 + 21 + 28, subject to a maximum of 100]		100	100
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE				
30.	Component Score (S_{of})[c] [highest score from line 29 for all watersheds evaluated, subject to a maximum of 100]		100	100

[a] Maximum value applies to waste characteristics category.
[b] Maximum value not applicable.
[c] Do not round to nearest integer.

4.0 SURFACE-WATER MIGRATION PATHWAY

4.1 OVERLAND/FLOOD MIGRATION COMPONENT

4.1.1.1 DEFINITION OF THE HAZARDOUS SUBSTANCE MIGRATION PATH FOR OVERLAND/FLOOD COMPONENT - SOURCE 3

Prior to landfilling, the entire area of Source 3 was covered in E2EM wetlands located within Herring Run; therefore the PPE is into these wetlands (Ref. 81, p. 15 and Figure 3). Because the entire source is located in surface waters, the in-water segment of the surface water pathway TDL was determined from the farthest upstream and downstream points where the island would discharge into Herring Run (PPE_{3A}, $PPE_{3B,}$ PPE_{3C} and PPE_{3D}). From the northern portion of the source, Herring Run flows from the farthest upstream PPEs (PPE_{3A} and PPE_{3B}) for about 0.5 mile to the southeast before discharging into the Back River. The Back River flows for about 8.5 miles before discharging into the Chesapeake Bay. The 15-mile surface water pathway TDL ends in the Chesapeake Bay (see Figures 5 and 6 in Appendix A).

Available data indicates that all of the surface waters located along the 15-mile TDL are tidally influenced (Ref. 16; Ref. 17; Ref. 18; Ref. 62; Ref. 82, Logbook 2, pp. 7, 26, 28, 35, and 38). Data does not exist to document the potential tidal carry of hazardous substances in the area of the site; however, during the April 6 through May 3, 2000 ESI, the sampling team observed and documented the tidal effect on Herring Run (Ref. 82, Logbook 2, pp. 7, 26, 28, 35, and 38). The uppermost reach of the tidal effect was observed at the second overpass of the Interstate 95 highway (Ref. 18; Ref. 82, Logbook 2, p. 7).

4.1.2.1 Likelihood of Release

4.1.2.1.1 Observed Release - Source 3

Direct Observation - Source 3

- Basis for Direct Observation - Source 3

Source 3 is an approximately 3.8-acre area where Robb Tyler began disposing of waste sometime in the late 1950s or early 1960s (Ref. 8, p. 20; Ref. 9, p. 5; Ref. 12, p. 27; Ref. 23). Aerial photographs document waste disposal activities at Source 3 beginning in 1966 and continuing until 1973 (Ref. 12, pp. 22 through 29; Ref. 81). Historical aerial photographs document that at the time the landfilling was actively occurring the entire area of Source 3 was vegetated with E2EM wetlands (Ref. 81, p. 12).

Source 3 forms an island within Herring Run; therefore waste containing hazardous substances disposed of here would also be in direct contact with the waters of Herring Run during flood events. The entire 68th Street Dump lies within the 100-year flood plain and Baltimore County is nationally identified as an area that suffers severe losses due to floods (Ref. 86; Ref. 88, p. 3). Major floods have occurred in Baltimore County in October 1954, August 1955, August 1971, June 1972 and September 1975 (Ref. 64, p. 7; Ref. 87, p. 4). One of the most damaging floods recorded in the Baltimore area occurred on August 1 through 2, 1971. The flood waters recorded in the Back River basin were equivalent to, or in excess of, the 100-year flood interval (Ref. 87, p. 7). A second major flood occurred in Baltimore during Hurricane Agnes, from June 21 through 23 1972. Flood peaks greater than 100-year intervals were recorded in Baltimore at this time (Ref. 87, p. 7). Because the entire area of Source 3 is located within the 100-year flood zone, the waste that contained hazardous substances, which documentation indicates was disposed of at Source 3, was in direct contact with these flood waters. The National Climatic Data Center (NCDC) has documented several, more recent storm events (June 1996, September 1999, and July 14, 2000) that have caused flash flooding in the area where the 68th Street Dump site is located (Ref. 63). In 1996, Hurricane Fran produced stream flows in Maryland among the highest ever seen and in 1999 heavy downpours (4.77 inches fell in the space of a few hours) led to major flooding in the Baltimore area (Ref. 89, p.1; Ref. 90, p. 1). Analytical results from the samples collected from Source 3 in 1985 and in April 2000 document that hazardous substances were present at Source 3 during these flash flood events. Additional evidence that the area of the 68th Street Dump is prone to flash floods is provided by observations of the banks of Herring Run and Moore's Run. The banks of these streams adjacent to the 68th Street Dump site show evidence of the increase in flow due to storm events (Ref. 15, p. 5; Ref. 18; Ref. 68; Ref. 69; Ref. 76). Exposed landfilled materials have been observed in Herring Run due to erosion of its bank (Ref. 69).

- Hazardous Substances in the Release - Source 3

Documentation that the materials deposited in the wetlands of Source 3 contained hazardous substances is provided by analytical results for samples collected from drums found at Source 3. MD WMA completed a reconnaissance of Source 3 in February 1985. Numerous drums were observed embedded in the ground at this time (Ref. 8, p. 3). MD WMA collected samples from four of these drums. The samples were analyzed for total metals, purgeable halocarbons (using EPA Method 601), and purgeable aromatics (using EPA Method 602) (Ref. 8, p. 59 and pp. 113 through 121). The table below summarizes the results for the laboratory analysis of these samples.

Hazardous Substance	Evidence	Concentration (µg/kg)	Reference
Organics			
Toluene	IE 002A	200	8, p. 114
	IE 004A	2,800,000	8, p. 120
Ethylbenzene	IE 002A	310	8, p. 114
	IE 004A	16,780,000	8, p. 120
Xylenes	IE 002A	270	8, p. 114
	IE 004A	92,270,000	8, p. 120
Total Purgeable Halocarbons	IE 002A	4,000	8, p. 114
Metals		**(mg/kg)**	
Arsenic	IE 001B	7.46	8, p. 112
Cadmium	IE 001B	0.89	8, p. 112
	IE 002B	89.8	8, p. 115
Chromium	IE 001B	48.3	8, p. 112
	IE 002B	1,855	8, p. 115
Lead	IE 002B	8,105	8, p. 115
Nickel	IE 001B	2,759	8, p. 112
	IE 002B	781	8, p. 115
	IE 004B	24.7	8, p. 121
Zinc	IE 001B	51,232	8, p. 112
	IE 002B	817	8, p. 115
	IE 003B	245	8, p. 118

Notes:
mg/kg Milligrams per kilogram
µg/kg Micrograms per kilogram

Samples of material from drums found at Source 3 were also collected by EPA Region 3's TAT during an emergency response at Source 3 in July 1985. The samples were analyzed for VOCs. The table below summarizes the results of the analysis of these samples.

Hazardous Substance	Evidence	Concentration (µg/kg)	Reference
Organics			
Acetone	Station #1	3,100 J	21, p. 1
	Station #4	7,700	21, p. 4
	Station #6	33,000	21, p. 7
Benzene	Station # 2	68,000	21, p. 2
	Station #6	26,000	21, p. 7
2-Butanone	Station #5	3,100	21, p. 5
	Station #6	6,000	21, p. 7
1,1-Dichloroethane	Station #2	1,400 J	21, p. 2
Toluene	Station # 1	90,000	21, p. 1
	Station #2	>1,400,000	21, p. 2
	Station #4	41,000	21, p. 4
1,1,1-Trichloroethane	Station #4	8,700	21, p. 4
	Station #5	1,600	21, p. 5
	Station #6	13,000	21, p. 7
1,1,1-Trichloroethane	Station #2	10,000	21, p. 2
Trichloroethylene	Station #2	730 J	21, p. 2
Ethylbenzene	Station # 2	>6,000,000	21, p. 2
	Station #3	1,300	21, p. 3
	Station #4	15,000	21, p. 4
	Station #5	2,800	21, p. 5
Xylenes	Station #1	150,000	21, p. 1
	Station #3	6,800	21, p. 3
	Station #4	80,000	21, p. 4
	Station #5	14,000	21, p. 5
	Station #6	18,000	21, p. 7

Notes:
µg/kg Micrograms per kilogram
Analytical Data Qualifiers:
J Analyte present; reported value may not be accurate or precise

Chemical Analysis - Source 3

Source 3 is located downstream of Sources 1, 2, and 4; therefore a separate observed release by chemical analysis was not documented for this source individually; however all of the hazardous substances detected in the release samples documented in Section 4.1.2.1.1, Observed Release in the HRS documentation record for the entire site were also detected at Source 3. Source 3 is therefore partially attributable to the release of these hazardous substances.

4.1.2.2 WASTE CHARACTERISTICS

4.1.2.2.1 Toxicity/Persistence

Source 3 has a surface water containment value greater than zero; therefore, all of the hazardous substances detected at Source 3 are presented in the table below.

Highest Toxicity/Persistence Value = 10,000

4.1.2.2.2 Hazardous Waste Quantity

Source HWQ values assigned are summarized below.

Source No.	Source Name	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is Source Hazardous Constituent Quantity Data Complete? (Yes/No)
3	Island Landfill	7.56	No
	TOTAL	**7.56***	

* Level II targets documented downstream of this source; therefore an HWQ factor value of 100 is assigned (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value (Ref. 1, Section 2.4.2.2) = 100

4.1.2.2.3 Waste Characteristics Factor Category Value

The waste characteristics factor value for the drinking water threat is calculated below, as specified in the HRS Final Rule Section 2.4.3.1 (Ref. 1):

Toxicity/Persistence Factor Value = 10,000
HWQ Factor Value = 100
Toxicity/Persistence Factor Value (10,000) × HWQ Factor Value (100) = 1×10^6

Waste Characteristics Factor Category Value (Ref. 1, Table 2-7) = 32

4.1.2.3 DRINKING WATER TARGETS

There are no drinking water intakes located within the 15-mile TDL; therefore, the drinking water threat was not scored (Ref. 67).

4.1.3.2 Waste Characteristics

4.1.3.2.1 Toxicity/Persistence/Bioaccumulation

See Section 4.1.2.2 of the HRS Documentation Record for the toxicity/persistence factor values, the human food chain bioaccumulation values, and the combined toxicity/persistence/bioaccumulation factor values for all hazardous substances detected at Source 3.

==========

Toxicity/Persistence/Bioaccumulation Factor Value = $5x10^8$

4.1.3.2.2 Hazardous Waste Quantity

Source HWQ values assigned are summarized below.

Source No.	Source Name	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is Source Hazardous Constituent Quantity Data Complete? (Yes/No)
3	Island Landfill	7.56	No
	TOTAL	**7.56***	

* Level II targets documented downstream of this source; therefore an HWQ factor value of 100 is assigned (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value = 100

4.1.3.2.3 Waste Characteristics Factor Category Value

The waste characteristics factor value for the human food chain threat is calculated below, as specified in the HRS Final Rule (Ref. 1, Section 4.1.3.2.3):

Toxicity/Persistence Factor Value = 10,000
HWQ Factor Value = 100
Bioaccumulation Potential Factor Value (BPFV) = $5x10^{8}$

Toxicity/Persistence Factor Value (10,000) × HWQ Value (100) = 1×10^{6}
1×10^{6} × BPFV ($5x10^{8}$) = Waste Characteristics Product ($5x10^{14}$) (subject to maximum value of 1×10^{12})

Waste Characteristics Factor Category Value (Ref. 1, Table 2-7) = 1,000

Waste Characteristics Factor Category Value = 1,000

4.1.3.3 HUMAN FOOD CHAIN THREAT-TARGETS

Actual Human Food Chain Contamination

Herring Run has been established as a fishery along the entire 15-mile TDL (see Section 4.1.3.3 of the documentation record).

Sediment Samples - Herring Run

Sediment samples collected from Herring Run that contained hazardous substances having a bioaccumulation potential factor value of 500 or greater and that meet the criteria for an observed release are presented below. Hazardous substances detected in sediment samples collected downstream of all five sources were also detected at each individual source; therefore the release of these hazardous substances is partially attributable to each of the sources identified at the 68th Street Dump site. All of the samples shown below are documented in the observed release section, Sections 4.1.2.1.1 for the overall site. The bioaccumulation potential factor values are documented in Section 4.1.3.2.1 of the documentation record of the entire site.

Sample ID		Hazardous Substance	Sample Concentration (mg/kg)	Bioaccumulation Value
Metals				
BR-SD04	1, 2, 3, 4, 5	Zinc	464 L	500
BR-SD06	1, 2, 3, 4, 5	Zinc	327	500

Notes:

* All qualified data has been adjusted in accordance with EPA's fact sheet entitled "Using Qualified Data to Document an Observed Release and Observed Contamination" (Ref. 19). Where an adjustment is required, the adjusted value is shown in parenthesis.

mg/kg Milligrams per kilogram

Analytical Data Qualifiers:

L Analyte present; reported value may be biased low

Closed Fisheries

No closed fisheries have been established within the 15-mile TDL.

Level I Concentrations

No Level I concentrations have been established.

Most Distant Level II Sample

Analysis of sediment samples BR-SD04 and BR-SD06 detected a hazardous substance (zinc) in Herring Run that was also detected in samples collected from the drums dumped into the wetlands of Source 3.

Sample ID: BR-SD06
Distance from PPE_{3B}: 1,700 feet
Reference: Figures 2, 3, and 6 in Appendix A

Level II Fisheries

A hazardous substance that have bioaccumulation potential factor values of 500 or greater was detected in sediment samples collected from Herring Run. The extent of Level II fisheries that can be documented for Source 3 includes the distance from PPE_{3B} to sediment sampling location BR-SD06.

Identity of Fishery	Extent of the Level II Fishery
Herring Run	1,700 feet

4.1.3.3.1 Food Chain Individual

A food chain individual factor value of 45 is assigned for Source 3 because a portion of the Herring Run fishery is subject to Level II concentrations of hazardous substances that can be partially attributed to migration from Source 3 (Ref. 1).

Food Chain Individual Factor Value = 45

4.1.3.3.2 Population

4.1.3.3.2.1 Level I Concentrations

No Level I concentrations can be documented with the available data.

Level I Concentrations Factor Value = 0

4.1.3.3.2.2 Level II Concentrations

Herring Run is a fishery that has been documented to be subject to Level II concentrations of hazardous substances partially attributable to Source 3 of the 68th Street Dump site. The actual production value for Herring Run is unknown; therefore, the minimum production value is assigned for the area of actual contamination. The human food chain population value is based on HRS Final Rule Table 4-18 (Ref. 1).

Identity of Fishery	Annual Production (lbs)	References	Human Food Chain Population Value
Herring Run	> 0 to 100	9, p. 6; 16; 18; 68; 69; 70; 71; 72; and 76	0.03

Level II Concentrations Factor Value = 0.03

4.1.3.3.2.3 Potential Human Food Chain Contamination

The Back River and Chesapeake Bay are both designated fisheries located within the 15-mile downstream TDL (Ref. 16; Ref. 69; Ref. 70; Ref. 73). Production values for the Back River and the portion of the Chesapeake Bay within the 15-mile surface water TDL are not known, therefore, the potential for human food chain contamination is not scored and is assigned a contamination factor value of greater than 0.

Potential Human Food Chain Contamination Factor Value = >0

4.1.4 ENVIRONMENTAL THREAT

4.1.4.2 Waste Characteristics

4.1.4.2.1 <u>Ecosystem Toxicity/Persistence/Bioaccumulation</u>

See Section 4.1.4.2.1 of the HRS Documentation Record for the ecosystem toxicity/persistence factor values, the environmental bioaccumulation values and the ecosystem toxicity/persistence/bioaccumulation factor values for Source 3. The factor values were assigned from HRS Final Rule Tables 4-20 and 4-21 (Ref. 1).

4.1.4.2.2 Hazardous Waste Quantity

Source HWQ values assigned are summarized below.

Source No.	Source Name	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is Source Hazardous Constituent Quantity Data Complete? (Yes/No)
3	Island Landfill	7.56	No
	TOTAL	**7.56***	

* Level II targets documented downstream of this source; therefore an HWQ factor value of 100 is assigned (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value = 100

4.1.4.2.3 Waste Characteristics Factor Category Value

The factor value for the environmental threat is calculated as specified in the HRS Final Rule (Ref. 1). The calculations are presented below.

Ecosystem Toxicity/Persistence Value = 10,000
Ecosystem Bioaccumulation Potential Factor Value = 50,000
HWQ Factor Value = 100
Ecosystem Toxicity/Persistence x HWQ = $1x10^6$

(Ecosystem Toxicity/Persistence x HWQ) x
(Ecosystem Bioaccumulation Potential Factor Value) = $1x10^6 \times 50{,}000 = 5x10^{10}$

Waste Characteristics Factor Category Value = 320

4.1.4.3 Environmental Threat-Targets

- Level I Concentrations

No Level I concentrations of sensitive environments have been documented within the 15-mile downstream TDL.

Most Distant Level II Sample

Sediment sample BR-SD03 was collected in Herring Run. Wetlands are present at this location that run contiguous to Herring Run (Ref. 81). A hazardous substance (lead) was detected in this sample that was also detected in samples collected from drums dumped into the wetlands of Source 3.

Sample ID: BR-SD03
Distance from PPE_{3B}: 2,770 feet
Reference: Figures 2 and 3 in Appendix A

4.1.4.3.1 Sensitive Environments

4.1.4.3.1.2 Level II Concentrations

Sensitive Environments

No listed sensitive environments subject to Level II concentrations have been documented within the 15-mile downstream TDL.

Total Length of Wetlands - Source 3

The PPE of hazardous substances from Source 3 into surface waters is into the wetlands documented to have covered the entire area of Source 3 prior to landfilling. The total length of wetlands documented at Source 3 subject to Level II concentrations of hazardous substances is determined by measuring the total perimeter of Source 3. This length is 0.45 mile; therefore, the assigned HRS wetland rating for Source 3 is 25 (Ref. 1, Table 4-24, p. 51625; Ref. 23; Ref. 81, Figure 3).

4.1.4.3.1.3 Potential Contamination

The Chesapeake Bay is documented as habitat used by threatened species within the 15-mile surface water TDL (Ref. 75). The Chesapeake Bay is coastal tidal waters, therefore the assigned dilution weight of 0.0001 is assigned from the HRS Final Rule, Table 4-13 (Ref. 1).

Chesapeake Bay:

Sensitive Environment	Distance from Probable Point of Entry to Nearest Point of Sensitive Environment	Reference	Sensitive Environment Values
Habitat known to be used by Federal designated or proposed endangered or threatened species:			
Bald Eagle (*Haliaeetus leucocephalus*)	0	75	75
Peregrine Falcon (*falco percyrmus*)	0	75	75

TOTAL: 150

Wetlands

Wetlands not counted as Level II targets occur along the Back River and Chesapeake Bay within the 15-mile downstream TDL. The length of these wetlands are provided below.

Back River

The total length of wetlands subject to potential contamination located along Back River within the TDL is 4.5 miles; therefore the assigned value is 150 (see Figure 6 in Appendix A) (Ref. 1, Table 4-24; Ref. 17).

Chesapeake Bay

The total length of wetlands subject to potential contamination located downstream along the Chesapeake Bay within the TDL is 13.6 miles, therefore the wetlands assigned value is 350 (see Figure 6 in Appendix A) (Ref. 1, Table 4-24; Ref. 17).

Potential Contamination Factor Value

The potential contamination factor value (SP) is calculated as follows:

$$SP = \frac{(W + S)\ D}{10}$$

W = Value assigned for wetlands from HRS Table 4-24.
S = Value assigned for the sensitive environment from HRS Table 4-23.
D = Dilution weight assigned from HRS Table 4-13. Back River and Chesapeake Bay are coastal tidal waters (Ref. 17).

$$SP_{Back\ River} = \frac{(150 + 0)\ .0001}{10} = 0.0015$$

$$SP_{Chesapeake\ Bay} = \frac{(350 + 150)\ .0001}{10} = 0.005$$

$$SP_{Total} = 0.0015 + 0.005 = 0.0065$$

Potential Contamination Factor Value (SP) = 0.0065

APPENDIX F

SOURCE 4 SCORING

SOURCE 4 SCORESHEETS
REDHOUSE RUN LANDFILL

WORKSHEET FOR COMPUTING HRS SITE SCORE
68th STREET DUMP
SOURCE 4

		S	S^2
1.	Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	NS	
2a.	Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	100	10,000
2b.	Ground Water to Surface-water Migration Component (from Table 4-25, line 28)	NS	
2c.	Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	100	10,000
3.	Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22)	NS	
4.	Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	NS	
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		10,000
6.	**HRS Site Score** Divide the value on line 5 by four and take the square root		30,000

NS = Not scored

TABLE 4-1

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
68th STREET DUMP
SOURCE 4

Factor Categories and Factors		Maximum Value	Value Assigned
Drinking Water Threat			
	Likelihood of Release		
1.	Observed Release	550	550
2.	Potential to Release by Overland Flow		
	2a. Containment	10	---
	2b. Runoff	25	---
	2c. Distance to Surface Water	25	---
	2d. Potential to Release by Overland Flow [lines 2a x (2b +2c)] 500	---	
3.	Potential to Release by Flood		
	3a. Containment (Flood)	10	---
	3b. Flood Frequency	50	---
	3c. Potential to Release by Flood [lines 3a x 3b]	500	---
4.	Potential to Release [lines 2d + 3c, subject to a maximum of 500]	500	---
5.	Likelihood of Release [higher of lines 1 and 4]	550	550
	Waste Characteristics		
6.	Toxicity/Persistence	a	10,000
7.	Hazardous Waste Quantity	a	100
8.	Waste Characteristics	100	32
	Targets		
9.	Nearest Intake	50	0
10.	Population		
	10a. Level I Concentrations	b	0
	10b. Level II Concentrations	b	0
	10c. Potential Contamination	b	0
	10d. Population [lines 10a + 10b + 10c]	b	0
11.	Resources	5	0
12.	Targets [lines 9 + 10d + 11]	b	0
	Drinking Water Threat Score		
13.	Drinking Water Threat Score [(lines 5 x 8 x 12)/82,500, subject to a maximum of 100]	100	0

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT
SCORESHEET (Continued)
68th STREET DUMP
SOURCE 4

Factor Categories and Factors Assigned		Maximum Value	Value Assigned
Human Food Chain Threat			
	Likelihood of Release		
14.	Likelihood of Release [same value as line 5]	550	550
	Waste Characteristics		
15.	Toxicity/Persistence/Bioaccumulation	a	5×10^8
16.	Hazardous Waste Quantity	a	100
17.	Waste Characteristics	1,000	320
	Targets		
18.	Food Chain Individual	50	45
19.	Population		
	19a. Level I Concentrations	b	0
	19b. Level II Concentrations	b	0.03
	19c. Potential Human Food Chain Contamination	b	–
	19d. Population [lines 19a + 19b + 19c]	b	0.03
20.	Targets [lines 18 + 19d]	b	45.03
	Human Food Chain Threat Score		
21.	Human Food Chain Threat Score [(lines 14 x 17 x 20)/82,500, subject to a maximum of 100]	100	96.06

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT
SCORESHEET (Continued)
68TH STREET DUMP
SOURCE 4

Factor Categories and Factors Assigned		Maximum Value	Value Assigned
Environmental Threat			
	Likelihood of Release		
22.	Likelihood of Release [same value as line 5]	550	550
	Waste Characteristics		
23.	Ecosystem Toxicity/Persistence/Bioaccumulation	a	5×10^8
24.	Hazardous Waste Quantity	a	100
25.	Waste Characteristics	1,000	320
	Targets		
26.	Sensitive Environments		
	26a. Level I Concentrations	b	0
	26b. Level II Concentrations	b	25
	26c. Potential Contamination	b	0.0065
	26d. Sensitive Environments [lines 26a + 26b + 26c]	b	
27.	Targets [value from line 26d]	b	0.0065
	Environmental Threat Score		
28.	Environmental Threat Score [(lines 22 x 25 x 27)/82,500, subject to a maximum of 60]	60	25.00
	Surface Water Overland/Flood Migration Component Score for a Watershed		
29.	Watershed Score[c] [lines 13 + 21 + 28, subject to a maximum of 100]	100	100
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE			
30.	Component Score (S_{of})[c] [highest score from line 29 for all watersheds evaluated, subject to a maximum of 100]	100	100

[a] Maximum value applies to waste characteristics category.
[b] Maximum value not applicable.
[c] Do not round to nearest integer.

4.0 SURFACE-WATER MIGRATION PATHWAY

4.1 OVERLAND/FLOOD MIGRATION COMPONENT

4.1.1.1 DEFINITION OF THE HAZARDOUS SUBSTANCE MIGRATION PATH FOR OVERLAND/FLOOD COMPONENT - SOURCE 4

Prior to landfilling, the entire area of Source 4 was covered in PSS/FO wetlands located adjacent to Redhouse Run; therefore the PPE of hazardous substances from Source 4 is in these wetlands. (Ref. 81, p. 15 and Figure 3). The in-water segment of the surface water TDL was determined from a point on Redhouse Run adjacent to Source 4 (PPE_4). From the PPE in Redhouse Run (PPE_4) the stream flows to the southeast for approximately 0.25 mile until it discharges into Herring Run. Herring Run flows for about 0.70 mile until it discharges into the Back River. The remainder of the 15-mile TDL is outlined in the last paragraph of this section. The Back River flows in an eastwardly direction for approximately 8.5 miles until it discharges into the Chesapeake Bay. The 15-mile surface water pathway TDL ends in the Chesapeake Bay (see Figures 5 and 6 in Appendix A). Available data indicates that all of the surface water bodies located along the 15-mile TDL are tidally influenced (Ref. 16; Ref. 17; Ref. 18; Ref. 62; Ref. 82, Logbook 2, pp. 7, 26, 28, 35, and 38). Data does not exist to document the potential tidal carry of hazardous substances in the area of the site; however, during the April 6 through May 3, 2000 ESI, the sampling team observed and documented the tidal effect on Herring Run (Ref. 82, Logbook 2, pp. 7, 26, 28, 35, and 38). The uppermost reach of the tidal effect was observed at the second overpass of the Interstate 95 highway (Ref. 81; Ref. 82, Logbook 2, p. 7).

4.1.2.1 Likelihood of Release - Source 4

4.1.2.1.1 Observed Release - Source 4

Direct Observation - Source 4

- Basis for Direct Observation - Source 4

Prior to landfilling, Source 4 was completely covered in PSS/FO wetlands that were contiguous with Redhouse Run. As documented by the historical aerial photographs Robb Tyler disposed of wastes directly into these wetlands (Ref. 81). In addition, Source 4 is located within the 100-year flood plan in an area (Baltimore County) that has been nationally identified as an area that suffers severe losses due to floods (Ref. 86; Ref. 88, p. 3). Major floods have occurred in Baltimore County in October 1954, August 1955, August 1971, June 1972, and September 1975 (Ref. 64, p. 7; Ref. 87, p. 4). One of the most damaging floods recorded in the Baltimore area occurred on August 1 through 2, 1971. The flood waters recorded in the Back River basin were equivalent to, or in excess of, the 100-year flood interval (Ref. 87, p. 7). A second major flood occurred in Baltimore during Hurricane Agnes, from June 21 through 23, 1972. Flood peaks greater than 100-year intervals were recorded in Baltimore at this time (Ref. 87, p. 7). Because the entire area of Sources 1, 2, 3, 4, and 5 are located within the 100-year flood zone, the waste that contained hazardous substances, which documentation indicates was disposed of at these sources, was in direct contact with these flood waters. The National Climatic Data Center (NCDC) has documented several, more recent storm events (June 1996, September 1999, and July 14, 2000) that have caused flash flooding in the area where the 68th Street Dump site is located (Ref. 63). In 1996, Hurricane Fran produced stream flows in Maryland among the highest ever seen and in 1999 heavy downpours (4.77 inches fell in the space of a few hours) led to major flooding in the Baltimore area (Ref. 89, p.1; Ref. 90, p. 1).

- Hazardous Substances in the Release

During a photographic survey conducted by MD WMA on June 22, 1984, three 55-gallon drums were observed protruding from the ground at Source 4 (Ref. 32; Ref. 33). After the discovery of the drums MD WMA returned to Source 4 on June 28, 1984 to complete an investigation of the area. At this time it was determined that one of the estimated ten drums found at the source was full. Analytical results from a sample of the drum contents determined that the full drum contained paint sludge (Ref. 32). Robb Tyler's son, Alfred Tyler, the owner of the property at the time, secured the removal of 10 drums from Source 4 in July 1984 (Ref. 8, p. 2; Ref. 9, p. 5; Ref. 32; Ref. 33; Ref. 35). Additional evidence that hazardous wastes were disposed of at Source 4 is provided in testimony given to EPA investigators from a former employee of the Koppers Company. He stated that he helped dispose of 55-gallon drums of liquid solvent generated from the Koppers Company onto the ground in the area of Source 4 (Ref. 10, pp. 119, 120 and 122a). Also, the testimony of a former Robb Tyler truck driver indicates that wastes generated by General Motors were disposed of at Source 4. During his testimony, the former driver stated that he normally disposed of wastes from General Motors in a pit at Source 5; however he recalled that at one time when this area was closed the waste was dumped "over at Rob Tyler's office" (Ref. 83, pp. 85 and 86). Robb Tyler's office was located near Source 4 (Ref. 10, pp.108 and 166). The wastestream generated by General Motors and known to have been disposed of by Robb Tyler consisted

of 55-gallon drums of industrial wastewater treatment sludge; incinerator ash; paint sludge; solvents; waste oils; and styrofoam (Ref. 84, pp. 10 through 18) (Table 1, which can be found in Appendix B).

As detailed below, additional evidence of hazardous substances deposited into the wetlands of Source 4 is provided by laboratory analytical results of samples collected from this source. Wastes were encountered at Source 4 by MDE personnel in 1994 during collection of soil samples. Types of wastes encountered included fly ash and material with a strong oily odor, possibly associated with roofing waste (Ref. 60, p. 9). Trash, oily smells, and ash were also encountered at Source 4 during the test pit excavations conducted in 2000 (Ref. 82, Logbook 1, p. 42). Testimonies of former waste haulers document that fly ash from Baltimore Gas and Electric was deposited at all five sources that comprise the 68th Street Dump site (Ref. 10, pp. 7, 14, 17, 25, 27, 32, 33, 42, 4, 49, 58, 94, 96, 113, 114, 118a, 118b, 126, 130, 132, 145, 146, 149, 156, 161, 162, 164, 165 166).

Additional evidence of the presence of hazardous substances at Source 4 is documented by the results of four sampling events. Samples were collected from Source 4 in 1986 by the EPA Region 3 FIT, in 1993 and 1994 by MDE, and in 2000 by the EPA Region 3 SATA team. The tables below present the analytical results from each of these sampling events.

EPA FIT Sample Results - 1986

The EPA Region 3 FIT collected four samples from Source 4 during an SI conducted in 1986. Soil sample C9223/MC4964 was collected from soils where drums were removed in 1984, soil sample C9249/MC4962 was collected from a pile of fly ash (generated from the City of Baltimore incinerator) located northwest of the former Robb Tyler office building, sample C9248/MC4950 was collected from soils determined by BFI to exhibit the characteristic of reactivity, and C9250/MC4963 was collected from a drainage ditch that intersects Herring Run (Ref. 13, pp. Section 6 and Figure 3; Ref.14, pp. 2, 8, 14, 15, and 16). The samples collected during the SI were analyzed for organic and inorganic parameters by an EPA CLP laboratory. The analytical results for these samples are shown in the table below. No background samples were collected during the SI; therefore, the metal concentrations detected in the samples have been compared to the concentrations in the background sample collected by the EPA Region 3 SATA team during the ESI completed in 2000.

Hazardous Substance	Evidence	Concentration (µg/kg)	CRQL* (µg/kg)	Reference
Organics				
Bis(2-ethylhexyl) phthalate	C9223	611,129 J	330	13, p. 6-5
	C9249	7,656 J	330	13, p. 6-5
	C9250	10,388 J	330	13, p. 6-5
Pyrene	C9223	9,140 J	330	13, p. 6-5
	C9250	4,427 K	330	13, p. 6-5
Phenanthrene	C9250	2,938 J	330	13, p. 6-5
Chrysene	C9250	3,166 J	330	13, p. 6-5
Fluoranthene	C9223	1,644 K	330	13, p. 6-5

Hazardous Substance	Evidence	Concentration (mg/kg)	Background Concentration (CPBWSS-01A) (mg/kg)	CRDL* (mg/kg)	Reference
Metals					
Aluminum	MC4962	31,250	8,800	200	13, p. 6-6; 7, pp. 12 and 87
Arsenic	MC4950	13	4.3 L	2	13, p. 6-6; 7, pp. 12 and 87
	MC4962	45	4.3 L	2	13, p. 6-6; 7, pp. 12 and 87
	MC4964	26	4.3 L	2	13, p. 6-6; 7, pp. 12 and 87
Cadmium	MC4950	6.7	ND	1	13, p. 6-6; 7, pp. 12 and 87
	MC4963	1.45	ND	1	13, p. 6-6; 7, pp. 12 and 87
	MC4964	38	ND	1	13, p. 6-6; 7, pp. 12 and 87
Chromium	MC4950	260	27	2	13, p. 6-6; 7, pp. 12 and 87
	MC4962	280	27	2	13, p. 6-6; 7, pp. 12 and 87
Copper	MC4950	338	33.7	5	13, p. 6-6; 7, pp. 12 and 87
	MC4962	4,490	33.7	5	13, p. 6-6; 7, pp. 12 and 87
	MC4964	690	33.7	5	13, p. 6-6; 7, pp. 12 and 87
Lead	MC4950	622	101	0.6	13, p. 6-6; 7, pp. 12 and 87
	MC4962	2,850	101	0.6	13, p. 6-6; 7, pp. 12 and 87
	MC4964	1,960	101	0.6	13, p. 6-6; 7, pp. 12 and 87
Mercury	MC4950	3.2	0.18	0.1	13, p. 6-6; 7, pp. 12 and 87
	MC4964	0.8	0.18	0.1	13, p. 6-6; 7, pp. 12 and 87
Nickel	MC4962	1,100	16.3	8	13, p. 6-7; 7, pp. 12 and 87
	MC4964	64	16.3	8	13, p. 6-7; 7, pp. 12 and 87
Zinc	MC4950	790	142	4	13, p. 6-7; 7, pp. 12 and 87
	MC4962	23,900	142	4	13, p. 6-7; 7, pp. 12 and 87
	MC4964	1,760	142	4	13, p. 6-7; 7, pp. 12 and 87

Notes:

- • The sample quantitation limit cannot be determined with the available data.
- CRDL Contract-required detection limit
- CRQL Contract-required quantitation limit
- ND Not detected above the detection limit
- mg/kg Milligrams per kilogram
- µg/kg Micrograms per kilogram

Analytical Data Qualifiers:

- J Analyte present; reported value may not be accurate or precise
- K Analyte present; reported value may be biased high
- L Analyte present; reported value may be biased low

MDE Sample Results - 1993

MDE collected one composite soil sample from Source 4 during the ESI conducted in 1993. This sample was analyzed for TCL organic and TAL inorganic compounds in accordance with EPA CLP protocols (Ref. 9, p. 18). Two samples, Soil-5 and Soil-6, were collected during the ESI to establish background concentrations of metals (Ref. 9, pp. 20, 23, 24, and 27). These background concentrations have been used to determine the significance of metals detected at Source 4. If a metal was detected in both background samples, the sample with the higher concentration was used as the comparative sample. The analytical results for the sample collected at Source 4 are provided in the table below.

Hazardous Substance	Evidence	Concentration (µg/kg)	SQL (µg/kg)	Reference
Organics				
Anthracene	Soil-11	4,000	2,037	9, pp. 159 and 313
Benzo(a)anthracene	Soil-11	11,000 J	2,037	9, pp. 159 and 313
Benzo(b)fluoranthene	Soil-11	20,000 J+	10,185	9, pp. 159 and 315
Benzo(a)pyrene	Soil-11	8,800 J	2,037	9, pp. 159 and 313
Benzo(g,h,i)perylene	Soil-11	3,800 J	2,037	9, pp. 159 and 313
Bis(2-ethylhexyl)phthalate	Soil-11	72,000 +	10,185	9, pp. 159 and 315
Carbazole	Soil-11	2,600	2,037	9, pp. 159 and 313
Chrysene	Soil-11	8,500 J	2,037	9, pp. 159 and 313
Chlordane (alpha)	Soil-11	58J	10.4	9, pp. 167 and 362
Fluoranthene	Soil-11	20,000 +	10,185	9, pp. 159 and 315
Indeno(1,2,3-cd)-pyrene	Soil-11	4,200 J	2,037	9, pp. 159 and 313
Phenanthrene	Soil-11	14,000 +	2,037	9, pp. 159 and 315
Pyrene	Soil-11	13,000 J	2,037	9, pp. 159 and 313

Hazardous Substance	Evidence	Concentration (mg/kg)	Background Concentration (Soil-5 or Soil-6) (mg/kg)	SQL (mg/kg)	Reference
Metals					
Arsenic	Soil-11	33.8 L	3.9 L	2.5	9, pp. 110, 113, 211, 231 and 232
Cadmium	Soil-11	6.3	ND	1.3	9, pp. 110, 113, 211, 231 and 232
Copper	Soil-11	467	25.8	6.3	9, pp. 110, 113, 211, 231 and 232
Lead	Soil-11	1,530	201 J	0.8	9, pp. 110, 113, 211, 231 and 232
Mercury	Soil-11	0.85	0.28	0.13	9, pp. 110, 113, 211, 231 and 232
Nickel	Soil-11	224	ND	10	9, pp. 110, 113, 211, 231 and 232
Silver	Soil-11	17.5	ND	2.5	9, pp. 110, 113, 211, 231 and 232
Zinc	Soil-11	1,520	77.0	5.0	9, pp. 110, 113, 211, 231 and 232

Notes:

- CRDL Contract-required detection limit
- CRQL Contract-required quantitation limit
- ND Not detected above the detection limit
- mg/kg Milligrams per kilogram
- µg/kg Micrograms per kilogram

Analytical Data Qualifiers:

- J Analyte present; reported value may not be accurate or precise
- L Analyte present; reported value may be biased low
- [ ] Analyte present; as values approach the instrument detection limit the quantitation may not be accurate
- \+ Results taken from diluted sample

MDE Sample Results - 1994

MDE returned to Source 4 in 1994 to collect soil samples from 3 locations(Ref. 60, p. 2). The samples were analyzed in accordance with EPA CLP protocols for TCL organic and TAL inorganic parameters (Ref. 60, pp. 8 and 9; Ref. 61).

Hazardous Substance	Evidence	Concentration (µg/kg)	AQL (µg/kg)	Reference
1,2,4-Trimethylbenzene	S-5	475	179	61, pp. 17, 19 and 27
Naphthalene	S-5	281,000	165	61, pp. 17, 19 and 27
Benzo(b)fluoranthene	S-2	15,000	82.5	61, pp. 17, 19 and 27
Benzo(a)anthracene	S-5	90,000 J	165	61, pp. 17, 19 and 27
Benzo(a)pyrene	S-5	55,000 J	165	61, pp. 17, 19 and 27
Benzo(g,h,i)perylene	S-5	42,000	165	61, pp. 17, 19 and 27
Benzo(k)fluoranthene	S-5	95,000 J	165	61, pp. 17, 19 and 27
Bis(2-ethyhexyl)phthalate	S-5	45,000	165	61, pp. 17, 19 and 27
Buthylbenzylphthalate	S-2	22,000	82.5	61, pp. 17, 19 and 27
Carbazole	S-5	82,000 J	165	61, pp. 17, 19 and 27
Chrysene	S-2	8,200	82.5	61, pp. 17, 19 and 27
Dibenzofuran	S-5	76,000 J	165	61, pp. 17, 19 and 27
Fluoranthene	S-5	80,000 J	165	61, pp. 17, 19 and 27
Fluorene	S-5	70,000 J	165	61, pp. 17, 19 and 27
Indeno(1,2,3-cd)pyrene	S-5	55,000 J	165	61, pp. 17, 19 and 27
2-methylnaphthalene	S-5	132,000 J	165	61, pp. 17, 19 and 26
Aroclor-1260	S-2	564	82.5	61, pp. 17, 18 and 25

Notes:
AQL Actual quantitation limit
µg/kg Micrograms per kilogram
Analytical Data Qualifiers:
J Analyte present; reported value may not be accurate or precise

EPA SATA Team Sample Results - 2000

The EPA Region 3 SATA team collected samples from Source 4 as part of the ESI conducted in 2000. Sampling locations are shown in Figure 3 in Appendix A. The samples were analyzed for organic and inorganic parameters using CLP protocols. The samples collected for organic analysis were analyzed for SVOCs, PCBs and pesticides. The samples collected for inorganic analysis were analyzed for total metals. The table below summarizes the hazardous substances detected at Source 4 during the sampling event. To identify metal concentrations above background levels, the metal concentrations detected at Source 4 were compared to the concentrations detected in soil sample CPBWSS-01A, which was collected outside the influence of the site (Ref. 7, p. 12).

Hazardous Substance	Evidence	Concentration (µg/kg)	SQL (µg/kg)	Reference
Organics				
2-Methylnaphthalene	BLFWS-02B	630	559	7, p. 165; 79
Anthracene	BLF-SS02	1,200 J	1,919	7, p. 166; 79
Benzo(a)anthracene	BLF-SS02	4,400	1,919	7, p. 166; 79
Benzo(b)fluoranthene	BLF-SS02	6,000	1,919	7, p. 166; 79
Benzo(k)fluoranthene	BLF-SS02	3,200 J	1,919	7, p. 166; 79
Benzo(a)pyrene	BLF-SS02	5,000	1,919	7, p. 166; 79
Benzo(g,h,i)perylene	BLF-SS02	2,000	1,919	7, p. 166; 79
bis(2-Ethylhexyl)phthalate	BLFWS-02B	30,000	559	7, p. 166; 79
Chrysene	BLF-SS02	4,700	1,919	7, p. 166; 79
Fluoranthene	BLF-SS02	11,000	1,919	7, p. 166; 79
Indeno(1,2,3-cd)-pyrene	BLF-SS02	1,900	1,919	7, p. 166; 79
Phenanthrene	BLF-SS02	5,100	1,919	7, p. 166; 79
Pyrene	BLF-SS02	7,700	1,919	7, p. 166; 79

Hazardous Substance	Evidence	Concentration (mg/kg)	Background Concentration (CPBWSS-01A) (mg/kg)	SQL (mg/kg)	Reference
Metals					
Barium	BLFWS-04B	802	118.0	56.5	7, pp. 12, 60, 87
Cadmium	BLFWS-03B	13.9	ND	1.3	7, pp. 12, 60, 87
Chromium	BLFWS-02B	77.2	27	2.7	7, pp. 12, 60, 87
Copper	BLFWS-01B	3,200 J	33.7	7.9	7, pp. 12, 60, 87
Lead	BLFWS-03B	2,710	101	0.78	7, pp. 12, 60, 87
Mercury	BLFWS-03A	0.64	0.18	0.1	7, pp. 12, 60, 87
Nickel	BLFWS-03B	91.6	16.3	10.4	7, pp. 12, 60, 87

Hazardous Substance	Evidence	Concentration (mg/kg)	Background Concentration (CPBWSS-01A) (mg/kg)	SQL (mg/kg)	Reference
Silver	BLFWS-01B	4.5 L	ND	3.2	7, pp. 12, 60, 87
Zinc	BLFWS-01B	2,290	142	6.3	7, pp. 12, 60, 87

Notes:
- CRDL Contract-required detection limit
- CRQL Contract-required quantitation limit
- ND Not detected above the detection limit
- mg/kg Milligrams per kilogram
- µg/kg Micrograms per kilogram

Analytical Data Qualifiers:
- J Analyte present; reported value may not be accurate or precise
- L Analyte present; reported value may be biased low
- [ ] Analyte present; as values approach the instrument detection limit the quantitation may not be accurate
- + Results reported from diluted sample

Chemical Analysis - Source 4

- MDE ESI Sample Results - Source 4

An observed release by chemical analysis from Source 4 into Redhouse Run can be documented based on chemical analysis of samples collected during the MDE ESI (Ref. 9, pp. 18, 20, and 47). All samples collected during the ESI were analyzed for TCL organic and TAL inorganic compounds in accordance with EPA CLP protocols (Ref. 9, p. 18). A sample collected from Redhouse Run upstream of the source was chosen as a background sample. The sample collected in Redhouse Run was chosen as a suitable background sample because it was collected within the same environmental setting, during the same sampling event and analyzed by the same CLP laboratory as the release sample The release sample, SED-6, was collected downstream of PPE_{4A}, at the point where Redhouse Run discharges into Herring Run (Ref. 9, pp. 19 and 47).

- Background Sample

Sample ID	Sample Location	Depth (inches)	Date	Reference
SED-4	Redhouse Run	Unknown	6/2/93 - 6/3/93	9, pp. 19, 153, 170, 171

- Background Concentrations

Sample ID	Hazardous Substance	Sample Concentration	SQL	Reference
Organics		**(µg/kg)**	**(µg/kg)**	
SED-4	Pyrene	ND	465	9, pp. 153, 277; 79
	bis(2-ethylhexyl)phthalate	ND	465	9, pp. 153, 277; 79
	alpha-Chlordane	6.6	2.4	9, pp. 165, 345; 79
	gamma-Chlordane	7.2	2.4	9, pp. 165, 345; 79
Metals		**(mg/kg)**	**SQL (mg/kg)**	
SED-4	Copper	ND	22.3	9, pp. 112, 218; 79
	Lead	30.0	2.7	9, pp. 112, 218; 79
	Mercury	ND	0.5	9, pp. 112, 218; 79
	Nickel	ND	35.7	9, pp. 112, 218; 79
	Zinc	60.9	17.9	9, pp. 112, 218; 79

Notes:
- µg/kg Micrograms per kilogram
- mg/kg Milligrams per kilogram
- ND Not detected above the SQL
- SQL Sample quantitation limit; SQL calculations presented in reference 79

- Release Samples

Sample ID	Sample Location	Depth (inches)	Date	Reference
SED-6	Collected in Herring Run at confluence with Redhouse Run	Unknown	6/2/93	9, pp. 19, 20, 112, 170, 171; 77

- Release Concentrations

Sample ID	Hazardous Substance	Sample* Concentration	SQL	Reference
Organics		**(µg/kg)**	**(µg/kg)**	
SED-6	Pyrene	620	600	9, pp. 153, 281; 79
	bis(2-ethylhexyl)phthalate	1,800	600	9, pp. 153, 281; 79
	alpha-Chlordane	48	3.1	9, pp. 165, 347; 79
	gamma-Chlordane	50	3.1	9, pp. 165, 347; 79
Metals		**(mg/kg)**	**SQL (mg/kg)**	
SED-6	Copper	42.2	7.3	9, pp. 112, 220; 79
	Lead	121	0.9	9, pp. 112, 220; 79
	Mercury	0.28	0.15	9, pp. 112, 220; 79
	Nickel	22.6	11.7	9, pp. 112, 220; 79
	Zinc	230	5.9	9, pp. 112, 220; 79

Notes:

* All qualified data has been adjusted in accordance with EPA's fact sheet entitled "Using Qualified Data to Document an Observed Release and Observed Contamination" (Ref. 19). Where an adjustment is required, the adjusted value is shown in parenthesis.

µg/kg Micrograms per kilogram

mg/kg Milligrams per kilogram

SQL Sample quantitation limit; SQL calculations presented in reference 79

Analytical Data Qualifiers:

J Analyte present; reported value may not be accurate or precise

- EPA SATA Team Sample Results - 2000

An observed release by chemical analysis can also be documented with samples collected during the 2000 ESI completed by the EPA Region 3 SATA team. Analytical results from a downstream sample collected during this sampling event in Redhouse Run (RHRSD-04), was compared to the analytical results for a sample collected in Redhouse Run upstream of Source 4 (RHRSD-01). The sample collected in Redhouse Run was chosen as a suitable background sample because it was collected within the same environmental setting, during the same sampling event and analyzed by the same CLP laboratory as the release sample (Ref. 7, p. 20; Ref. 82, Logbook 2, pp. 38 and 39). All sampling locations are shown in Figure 3 in Appendix A.

- Background Sample

Sample ID	Sample Location	Depth (inches)	Date	Reference
RHRSD-01	Redhouse Run	0-6	5/3/00	7, p. 20; 18; 82, Logbook 2, p. 39

- Background Concentrations

Sample ID	Hazardous Substance	Sample Concentration (µg/kg)	SQL (µg/kg)	Reference
RHRSD-01	Pyrene	ND	407	7, p. 214; 79
	Chrysene	ND	407	7, p. 214; 79

Notes:
µg/kg Micrograms per kilogram
ND Not detected above the SQL
SQL Sample quantitation limit; SQL calculations presented in reference 79

- Release Sample

Sample ID	Sample Location	Depth (inches)	Date	Reference
RHRSD-04	Redhouse Run	0-6	5/3/00	7, p. 20; 18; 82, Logbook 2, p. 38

- Release Concentrations

Sample ID	Hazardous Substance	Sample Concentration (µg/kg)	SQL (µg/kg)	Reference
RHRSD-04	Pyrene	800	402	7, p. 214; 79
	Chrysene	420	402	7, p. 214; 79

Notes:

µg/kg Micrograms per liter
SQL Sample quantitation limit; SQL calculations presented in reference 79

Attribution

As described in the source description section for Source 4, Robb Tyler disposed of wastes that contained hazardous substances at Source 4. Hazardous substances detected at Source 4 were also detected above background concentrations in a sediment sample collected in Redhouse Run downstream of Source 4. Redhouse Run is not located along the 15-mile TDL of any of the other four sources evaluated at the 68th Street Dump site. A sample collected of the incinerator ash located at Source 4 indicated elevated levels of arsenic, copper, lead, mercury, nickel, and zinc. These hazardous substances were also found to be elevated in the downstream release sample. No other potential sources of this contamination have been identified at this time.

Hazardous Substances in the Release

alpha-Chlordane
bis(2-ethylhexyl)phthalate
Chrysene
Copper
gamma-Chlordane
Lead
Mercury
Nickel
Pyrene
Zinc

4.1.2.2 WASTE CHARACTERISTICS

4.1.2.2.1 Toxicity/Persistence

See Section 4.1.2.2 of the HRS Documentation Record for the toxicity/persistence values for Source 4.

Highest Toxicity/Persistence Value = 10,000

4.1.2.2.2 Hazardous Waste Quantity

Source HWQ values assigned are summarized below.

Source No.	Source Name	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is Source Hazardous Constituent Quantity Data Complete? (Yes/No)
4	Redhouse Run Landfill	5.77*	No
	TOTAL	**5.77***	

* Level II targets documented downstream of this source; therefore an HWQ factor value of 100 is assigned (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value (Ref. 1, Section 2.4.2.2) = 100

4.1.2.2.3 Waste Characteristics Factor Category Value

The waste characteristics factor value for the drinking water threat is calculated below, as specified in the HRS Final Rule Section 2.4.3.1 (Ref. 1):

Toxicity/Persistence Factor Value = 10,000
HWQ Factor Value = 100
Toxicity/Persistence Factor Value (10,000) × HWQ Factor Value (100) = 1×10^6

4.1.2.3 DRINKING WATER TARGETS

There are no drinking water intakes located within the 15-mile TDL; therefore, the drinking water threat was not scored (Ref. 67).

4.1.3.2 Waste Characteristics

4.1.3.2.1 Toxicity/Persistence/Bioaccumulation

See Section 4.1.2.2 of the HRS Documentation Record for the toxicity/persistence factor values, the human food chain bioaccumulation values, and the combined toxicity/persistence/bioaccumulation factor values for all hazardous substances detected at Source 4.

==========

Toxicity/Persistence/Bioaccumulation Factor Value = $5x10^8$

4.1.3.2.2 Hazardous Waste Quantity

Source HWQ values assigned are summarized below.

Source No.	Source Name	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is Source Hazardous Constituent Quantity Data Complete? (Yes/No)
4	Redhouse Run Landfill	5.77	No
	TOTAL	**5.77***	

* Level II targets documented downstream of this source; therefore an HWQ factor value of 100 is assigned (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value = 100

4.1.3.2.3 Waste Characteristics Factor Category Value

The waste characteristics factor value for the human food chain threat is calculated below, as specified in the HRS Final Rule (Ref. 1, Section 4.1.3.2.3):

Toxicity/Persistence Factor Value = 10,000
HWQ Factor Value = 100
Bioaccumulation Potential Factor Value (BPFV) = $5x10^{8}$

Toxicity/Persistence Factor Value (10,000) × HWQ Value (100) = 1×10^{6}
1×10^{6} × BPFV ($5x10^{8}$) = Waste Characteristics Product ($5x10^{14}$) (subject to maximum value of 1×10^{12}

Waste Characteristics Factor Category Value (Ref. 1, Table 2-7) = 1,000

Waste Characteristics Factor Category Value = 1,000

4.1.3.3 HUMAN FOOD CHAIN THREAT-TARGETS

Actual Human Food Chain Contamination

Herring Run has been established as a fishery along the entire 15-mile TDL (see Section 4.1.3.3 of the documentation record).

Sediment Samples - Herring Run

Sediment samples collected from Herring Run that contained hazardous substances having a bioaccumulation potential factor value of 500 or greater and that meet the criteria for an observed release are presented below. Hazardous substances detected in sediment samples collected downstream of all five sources were also detected at each individual source; therefore the release of these hazardous substances is partially attributable to each of the sources identified at the 68th Street Dump site. In addition, SED-6 is also provided because it is located directly downstream of Source 4 at the confluence of Redhouse Run and Herring Run. The sample is documented in the observed release section of this Appendix, the remainder of the samples are documented in the observed release section of the documentation record for the entire site. The bioaccumulation potential factor values are documented in Section 4.1.3.2.1 of the documentation record of the entire site.

Sample ID	Downstream of Source No.	Hazardous Substance	Sample Concentration* (µg/kg)	Bioaccumulation Value
Organics				
SED-6	4	bis(2-ethylhexyl)phthalate	1,800	50,000
		alpha-Chlordane	48	500
		gamma-Chlordane	50	50,000
BR-SD03	1,2,3,4,5	Benzo(a)anthracene	650	50,000
		Benzo(k)fluoranthene	620	50,000
		Benzo(a)pyrene	680	50,000
Sample ID		**Hazardous Substance**	**Sample Concentration (mg/kg)**	**Bioaccumulation Value**
Metals				
SED-6	4	Copper	42.2	50,000
		Mercury	0.28	50,000
		Zinc	230	500
BR-SD04	1, 2, 3, 4, 5	Zinc	464 L	500
BR-SD06	1, 2, 3, 4, 5	Zinc	327	500

Notes:

* All qualified data has been adjusted in accordance with EPA's fact sheet entitled "Using Qualified Data to Document an Observed Release and Observed Contamination" (Ref. 19). Where an adjustment is required, the adjusted value is shown in parenthesis.

mg/kg Milligrams per kilogram

µg/kg Micrograms per kilogram

Analytical Data Qualifiers:

L Analyte present; reported value may be biased low

Closed Fisheries

No closed fisheries have been established within the 15-mile TDL.

Level I Concentrations

No Level I concentrations have been established.

Most Distant Level II Sample

Analysis of sediment samples SED-6, BR-SD04, and BR-SD06 detected a hazardous substance (zinc) that was separately documented in an observed release by chemical analysis for Source 4. Sediment samples, SED-6, BR-SD04, and BR-SD06, document that zinc has been released into the Herring Run fishery downstream of PPE_4.

Sample ID: BR-SD06
Distance from confluence of Redhouse Run and Herring Run: 581 feet
Reference: Figures 2, 3, and 6 in Appendix A

Level II Fisheries - 68th Street Dump site

A hazardous substance that has a bioaccumulation potential factor value of 500 or greater was detected in a sediment sample collected from Herring Run. The extent of Level II fisheries that can be documented for BR-SD-6 includes the distance from Redhouse Run and Herring Run to sediment sampling location BR-SD06.

Identity of Fishery	Extent of the Level II Fishery
Herring Run	581 feet

4.1.3.3.1 Food Chain Individual

A food chain individual factor value of 45 is assigned for Source 4 because a portion of the Herring Run fishery is subject to Level II concentrations of hazardous substances that can be partially attributed to migration from Source 4 (Ref. 1).

Food Chain Individual Factor Value = 45

4.1.3.3.2 Population

4.1.3.3.2.1 Level I Concentrations

No Level I concentrations can be documented with the available data.

Level I Concentrations Factor Value = 0

4.1.3.3.2.2 Level II Concentrations

Herring Run is a fishery that has been documented to be subject to Level II concentrations of hazardous substances partially attributable to Sources 4 of the 68th Street Dump site. The actual production value for Herring Run is unknown; therefore, the minimum production value is assigned for the area of actual contamination. The human food chain population value is based on HRS Final Rule Table 4-18 (Ref. 1).

Identity of Fishery	Annual Production (lbs)	References	Human Food Chain Population Value
Herring Run	> 0 to 100	9, p. 6; 16; 18; 68; 69; 70; 71; 72; and 76	0.03

Level II Concentrations Factor Value = 0.03

4.1.3.3.2.3 Potential Human Food Chain Contamination

The Back River and Chesapeake Bay are both designated fisheries located within the 15-mile downstream TDL (Ref. 16; Ref. 69; Ref. 70; Ref. 73). Production values for the Back River and the portion of the Chesapeake Bay within the 15-mile surface water TDL are not known, therefore, the potential for human food chain contamination is not scored and is assigned a contamination factor value of greater than zero.

Potential Human Food Chain Contamination Factor Value = >0

4.1.4 ENVIRONMENTAL THREAT

4.1.4.2 Waste Characteristics

4.1.4.2.1 <u>Ecosystem Toxicity/Persistence/Bioaccumulation</u>

See Section 4.1.4.2.1 of the HRS Documentation Record for the ecosystem toxicity/persistence factor values, the environmental bioaccumulation values and the ecosystem toxicity/persistence/bioaccumulation factor values for Source 4. The factor values were assigned from HRS Final Rule Tables 4-20 and 4-21 (Ref. 1).

4.1.4.2.2 Hazardous Waste Quantity

Source HWQ values assigned are summarized below.

Source No.	Source Name	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is Source Hazardous Constituent Quantity Data Complete? (Yes/No)
4	Redhouse Run Landfill	5.77	No
	TOTAL	**5.77***	

* Level II targets documented downstream of this source; therefore an HWQ factor value of 100 is assigned (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value = 100

4.1.4.2.3 Waste Characteristics Factor Category Value

The factor value for the environmental threat is calculated as specified in the HRS Final Rule (Ref. 1). The calculations are presented below.

Ecosystem Toxicity/Persistence Value = 10,000
Ecosystem Bioaccumulation Potential Factor Value = 50,000
HWQ Factor Value = 100
Ecosystem Toxicity/Persistence x HWQ = $1x10^6$

(Ecosystem Toxicity/Persistence x HWQ) x
(Ecosystem Bioaccumulation Potential Factor Value) = $1x10^6 \times 50{,}000 = 5x10^{10}$

Waste Characteristics Factor Category Value = 320

4.1.4.3 Environmental Threat-Targets

- Level I Concentrations

No Level I concentrations of sensitive environments have been documented within the 15-mile downstream TDL.

Most Distant Level II Sample

Sediment sample BR-SD03 was collected in Herring Run. Wetlands are present at this location that run contiguous to Herring Run (Ref. 81). Hazardous substances (benzo(a)pyrene, benzo(a)anthracene, and benzo(k)fluoranthene) were detected in this sample that were also detected at Source 4.

Sample ID: BR-SD03
Distance from PPE_4: 3,014 feet
Reference: Figures 2 and 3 in Appendix A

4.1.4.3.1 Sensitive Environments

4.1.4.3.1.2 Level II Concentrations

Sensitive Environments

No listed sensitive environments subject to Level II concentrations have been documented within the 15-mile downstream TDL.

Wetlands

The PPE of hazardous substances from Source 4 is into the wetlands documented to have covered the entire area of Source 4 prior to landfilling. The total length of wetlands documented at Source 4 subject to Level II concentrations of hazardous substances is determined by measuring the total perimeter of Source 4. This length is 0.40 mile; therefore the assigned HRS wetland rating for Source 4 is 25 (Ref. 1, Table 4-24; Ref. 23; Ref. 81, Figure 3).

4.1.4.3.1.3 Potential Contamination

The Chesapeake Bay is documented as habitat used by threatened species within the 15-mile surface water TDL (Ref. 75). The Chesapeake Bay is coastal tidal waters, therefore the assigned dilution weight of 0.0001 is assigned from the HRS Final Rule, Table 4-13 (Ref. 1).

Chesapeake Bay:

Sensitive Environment	Distance from Probable Point of Entry to Nearest Point of Sensitive Environment	Reference	Sensitive Environment Values
Habitat known to be used by Federal designated or proposed endangered or threatened species:			
Bald Eagle (*Haliaeetus leucocephalus*)	0	75	75
Peregrine Falcon (*falco percyrmus*)	0	75	75

TOTAL: 150

Wetlands

Wetlands occur along the Herring Run, Back River and Chesapeake Bay within the 15-mile downstream TDL. The length of these wetlands are provided below.

Back River

The total length of wetlands subject to potential contamination located along Back River within the TDL is 4.5 miles; therefore the assigned value is 150 (see Figure 6 in Appendix A) (Ref. 1, Table 4-24; Ref. 17).

Chesapeake Bay

The total length of wetlands subject to potential contamination located downstream along the Chesapeake Bay within the TDL is 13.6 miles, therefore the wetlands assigned value is 350 (see Figure 6 in Appendix A) (Ref. 1, Table 4-24; Ref. 17).

Potential Contamination Factor Value

The potential contamination factor value (SP) is calculated as follows:

$$SP = \frac{(W + S)\ D}{10}$$

W = Value assigned for wetlands from HRS Table 4-24.
S = Value assigned for the sensitive environment from HRS Table 4-23.
D = Dilution weight assigned from HRS Table 4-13. Back River and Chesapeake Bay are coastal tidal waters (Ref. 17).

$$SP_{Back\ River} = \frac{(150 + 0)\ .0001}{10} = 0.0015$$

$$SP_{Chesapeake\ Bay} = \frac{(350 + 150)\ .0001}{10} = 0.005$$

$$SP_{Total} = 0.0015 + 0.005 = 0.0065$$

Potential Contamination Factor Value (SP) = 0.0065

APPENDIX G

SOURCE 5 SCORING

SOURCE 5 SCORESHEETS
INDUSTRIAL ENTERPRISES/UNCLAIMED LANDFILL

WORKSHEET FOR COMPUTING HRS SITE SCORE
68th STREET DUMP
SOURCE 5

		S	S^2
1.	Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	NS	
2a.	Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	100	10,000
2b.	Ground Water to Surface-water Migration Component (from Table 4-25, line 28)	NS	
2c.	Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	100	10,000
3.	Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22)	NS	
4.	Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	NS	
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		10,000
6.	**HRS Site Score** Divide the value on line 5 by four and take the square root		50.00

NS = Not scored

TABLE 4-1

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
68th STREET DUMP
SOURCE 5

	Factor Categories and Factors	Maximum Value	Value Assigned
	Drinking Water Threat		
	Likelihood of Release		
1.	Observed Release	550	550
2.	Potential to Release by Overland Flow		
	2a. Containment	10	---
	2b. Runoff	25	---
	2c. Distance to Surface Water	25	---
	2d. Potential to Release by Overland Flow [lines 2a x (2b +2c)] 500	---	
3.	Potential to Release by Flood		
	3a. Containment (Flood)	10	---
	3b. Flood Frequency	50	---
	3c. Potential to Release by Flood [lines 3a x 3b]	500	---
4.	Potential to Release [lines 2d + 3c, subject to a maximum of 500]	500	---
5.	Likelihood of Release [higher of lines 1 and 4]	550	550
	Waste Characteristics		
6.	Toxicity/Persistence	a	10,000
7.	Hazardous Waste Quantity	a	100
8.	Waste Characteristics	100	32
	Targets		
9.	Nearest Intake	50	0
10.	Population		
	10a. Level I Concentrations	b	0
	10b. Level II Concentrations	b	0
	10c. Potential Contamination	b	0
	10d. Population [lines 10a + 10b + 10c]	b	0
11.	Resources	5	0
12.	Targets [lines 9 + 10d + 11]	b	0
	Drinking Water Threat Score		
13.	Drinking Water Threat Score [(lines 5 x 8 x 12)/82,500, subject to a maximum of 100]	100	0

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT
SCORESHEET (Continued)
68th STREET DUMP
SOURCE 5

Factor Categories and Factors Assigned		Maximum Value	Value Assigned
Human Food Chain Threat			
	Likelihood of Release		
14.	Likelihood of Release [same value as line 5]	550	550
	Waste Characteristics		
15.	Toxicity/Persistence/Bioaccumulation	a	5×10^8
16.	Hazardous Waste Quantity	a	100
17.	Waste Characteristics	1,000	1,000
	Targets		
18.	Food Chain Individual	50	45
19.	Population		
	19a. Level I Concentrations	b	0
	19b. Level II Concentrations	b	0.03
	19c. Potential Human Food Chain Contamination	b	–
	19d. Population [lines 19a + 19b + 19c]	b	0.03
20.	Targets [lines 18 + 19d]	b	45.03
	Human Food Chain Threat Score		
21.	Human Food Chain Threat Score [(lines 14 x 17 x 20)/82,500, subject to a maximum of 100]	100	100

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT
SCORESHEET (Continued)
68TH STREET DUMP
SOURCE 5

Factor Categories and Factors Assigned		Maximum Value	Value Assigned
Environmental Threat			
	Likelihood of Release		
22.	Likelihood of Release [same value as line 5]	550	550
	Waste Characteristics		
23.	Ecosystem Toxicity/Persistence/Bioaccumulation	a	5×10^8
24.	Hazardous Waste Quantity	a	100
25.	Waste Characteristics	1,000	320
	Targets		
26.	Sensitive Environments		
	26a. Level I Concentrations	b	0
	26b. Level II Concentrations	b	50
	26c. Potential Contamination	b	0.0065
	26d. Sensitive Environments [lines 26a + 26b + 26c]	b	
27.	Targets [value from line 26d]	b	50.01
	Environmental Threat Score		
28.	Environmental Threat Score [(lines 22 x 25 x 27)/82,500, subject to a maximum of 60]	60	53.33
	Surface Water Overland/Flood Migration Component Score for a Watershed		
29.	Watershed Score[c] [lines 13 + 21 + 28, subject to a maximum of 100]	100	100
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE			
30.	Component Score (S_{of})[c] [highest score from line 29 for all watersheds evaluated, subject to a maximum of 100]	100	100

[a] Maximum value applies to waste characteristics category.
[b] Maximum value not applicable.
[c] Do not round to nearest integer.

4.0 SURFACE-WATER MIGRATION PATHWAY

4.1 OVERLAND/FLOOD MIGRATION COMPONENT

4.1.1.1 DEFINITION OF THE HAZARDOUS SUBSTANCE MIGRATION PATH FOR OVERLAND/FLOOD COMPONENT - SOURCE 5

Prior to landfilling the entire area of Source 5 was covered in E2EM wetlands located adjacent to Herring Run; therefore the PPE of hazardous substances from Source 5 into surface waters is in these wetlands (Ref. 81, p. 15 and Figure 3). Two unnamed tributaries to Herring Run flow through Source 5. One of the tributaries originates in the western section of Source 5, flows to the south and eventually flows in an north-eastwardly direction prior to discharging into Herring Run. A second intermittent tributary flows through the southern portion of Source 5, eventually joining the first tributary (Ref. 20; Ref. 41; Ref. 42; Ref. 43). The in-water segment of the surface water pathway TDL was measured from three different starting points: 1) the point determined to be where the wetlands would discharge into the unnamed tributary located on Source 5 (PPE_{5A}); 2) the most upstream point in Herring Run where the Source 5 wetlands would discharge (PPE_{5B}); and 3) the most downstream point in Herring Run where the Source 5 wetlands would discharge (PPE_{5C}). From $PPE_{5A,}$ the unnamed tributary flows for approximately 2,640 feet until it discharges into Herring Run. From this point, Herring Run flows for approximately 1.2 mile until it enters the Back River. From the PPE farthest upstream in Herring Run (PPE_{5B}), Herring Run flows in a easterly direction for approximately 0.67 mile until it becomes the Back River. The remainder of the 15-mile TDL is outlined in the last paragraph of this section.

4.1.2.1 Likelihood of Release

4.1.2.1.1 Observed Release - Source 5

Direct Observation

-Basis for Direct Observation - Source 5

Historical aerial photographs document that prior to use as a dump E2EM wetlands covered the entire area of Source 5 (Ref. 81, Figure 3). MD DHMH inspection reports first document Robb Tyler's dumping into these wetlands in 1956 (Ref. 8, pp. 44 and 46; Ref. 40). These inspection reports further document that the refuse disposed of at Source 5 consisted mostly of industrial waste (Ref. 39). An inspection conducted in June 1956 described the dumping of wastes at this time as occurring "at a place where high ground slopes steeply down to a tidal marsh" (Ref. 8, p. 44). On the slope a large pit was observed where waste oil was being dumped. The pit was located "down near the water" and contained oil at the time of the inspection (Ref. 8, p. 44). Wastes were being dumped out into the marsh to dike Herring Run and allow for more dumping to occur in the area formerly occupied by wetlands (Ref. 8, p. 44). Also, the fill material reportedly contacted the water along much of the original shoreline. The inspector noted that "in places the fill has imparted a black deoxygenated look to the water" (Ref. 8, p. 2; Ref. 44, pp. 14 through 29). One such place was near the oil pit (Ref. 8, p. 44). An inspection conducted in December of 1956 further describes the oil pit located on Source 5. According to the foreman at the site, this pit was constructed for the deposition of oil sludge from the Standard Oil Company Refinery. Seepage out of the oil pit and into the surrounding marsh was observed at this time along with an oil slick on the water adjacent to the pit. A second pit was also noted during this inspection that contained oil and drained into the marsh from one end (Ref. 40). A photograph was taken on Source 5 that documents the "dumping of waste oil" into a pit. Wetland vegetation is clearly visible surrounding this pit (Ref. 91).

A deposition from a truck driver that hauled waste for Robb Tyler from the 1950s to 1979 provides documentation of the existence of pits located at Source 5 for the disposal of sludges and paint wastes. Waste disposed of into these pits was generated from General Motors, Signode Steel, O'Brien Paint, and Thompson's Wire. According to his deposition, there were two pits located at Source 5. The deponent testified that the size of the pits to be "two or three hundred yards around it" (Ref. 83, pp. 5, 9, 10, 15, 17, 18, 19, 21, 28, 29, 48, 64, 65, 66, 69). Testimony from another driver also provides evidence that General Motors wastes were deposited directly into wetlands. This driver stated that on a weekly basis, for a period of ten years, drummed paint waste generated by General Motors was poured onto the ground in the wetlands area of the site (Ref. 10, p. 4).

Further documentation of disposal of hazardous wastes into the wetlands of Source 5 is documented by a 1979 inspection completed by the Maryland Department of Natural Resources, Water Resources Administration. This inspection uncovered drums containing a gray-green solid dumped into a ravine located in wetlands (Ref. 41; Ref. 43; Ref. 45; Ref. 52, pp. 5, 6, 108). The review of historical aerial photographs taken during this time period also document that the area where these drums and associated wastes were disposed of was wetlands (Ref. 12, pp. 23, 24, and 25). A reinspection of the area where

these drums were dumped in 1980 revealed leachate in the stream bed located at the edge of this drum disposal area (Ref. 42).

The MD WMA conducted a reconnaissance of Source 5 on March 5, 1985. A drum disposal area different from the one encountered in 1979 was discovered at this time. The MD WMA observed an approximately 5 to 7 acre area located in the western portion of Source 5 that contained hundreds of drums (Ref. 15, pp. 3 through 5). Also observed during this reconnaissance was the oil seep into the unnamed tributary first observed in 1984. The seep was observed to still be leaching oil into the stream from an embankment adjacent to the stream (Ref. 15, p. 3; Ref. 48). In the eastern portion of Source 5, abandoned cars and trucks and hundreds of tires were observed. A recently excavated pit, measuring 120 feet by 50 feet, filled with tires was also observed in this area (Ref. 15, p. 4; Ref. 54, p. 5).

On June 28, 1984, an inspector from the Maryland Department of Natural Resources, Water Resources Administration observed an oil seep, subsequently determined to be a fuel oil, emerging from the bank of the unnamed tributary that flows through Source 5. In MDE file information, the location of this seep was depicted on Baltimore County Tax Map parcel 16 (Ref. 47 and Ref. 53).

Aerial photographs first document the deposition of wastes into the wetlands located on Source 5 in 1957 (Ref. 6; Ref. 81). The aerial photograph taken in 1957 shows a lagoon (noted as LG-1) located on Source 5 that contained dark-toned standing liquid (Ref. 12, pp. 16 and 17). Solid waste disposal is evident on aerial photographs taken of Source 5 continuing through 1973 (Ref. 12; Ref. 81).

- Hazardous Substances in the Release - Source 5

Information gathered during EPA investigations provides documentation of hazardous waste deposition at the 68th Street Dump by Robb Tyler. From the early 1950s through the 1970s, wastes from various industries located in the Baltimore area were disposed of at the five sources that comprise the 68th Street Dump. Written testimonies from haulers and former employees of Robb Tyler indicate that all types of wastes was accepted at the site (Ref. 10, pp. 4, 14, 17, 24, 38, 49, 50, 105, 155, 156 and 157). According to Robb Tyler, prior to the 1960s, there were no restrictions on the types of wastes that could be dumped at the landfill. Mr. Tyler further testified that drummed liquid wastes were disposed of at the 68th Street Dump site and stated that if "they could resell the drums brought in they would do so" (Ref. 84, p. 75). A former employee also testified that wastes in drums were dumped out so that Robb Tyler could sell the drums (Ref. 83, p. 23). These statements indicate that the wastes contained in the drums were disposed of directly into the wetlands that predominately covered all five source areas located at the site during the 1950s and 1960s (Ref. 81, Figures 4 and 5). Information is available for some of the generators of wastes disposed of at the site. The generators, wastes streams, and hazardous substances documented in these waste streams have been summarized in Table 1 in Appendix B. Wastes from most of these generators may have been disposed of at all five of the sources that comprise the site. Interviews of former waste haulers indicate that wastes were dumped at various areas of the site. Drivers were told where to dump their waste by the scale house operator or bulldoze operator after arrival at the dump (Ref. 10, pp.13, 14, 23, 24, 32, 44, 66, 113, 121, 124, 134 and 154). EPA's aerial photography analysis of wetland loss completed for the site supports the conclusion that from the late 1950s through 1968, dumping of wastes was occurring into the wetlands of all five sources (Ref. 81, p. 15 and Figures 3 through 7).

In some cases, available information is sufficient to document that a particular waste stream was disposed of at a specific source. Evidence indicates that waste streams generated by the following industries were disposed of at Source 5: Baltimore Gas and Electric; Allied Chemical; Western Electric; Noxell Corporation; GAF Materials; Armco; Koppers; the O'Brien Company; General Motors; Crown, Cork, & Seal; Bruning Paint Company; SCM (Glidden Durkee, Co.); Exxon (Standard Oil); Signode Steel; and the Baltimore Sun. Hazardous substances associated with the waste streams generated by these industries include trivalent chromium, potassium bichromate, copper, kepone, arsenic, chromium, fluoboric acid, cyanide acid, trichloroethene, sodium hydroxide, acetone, waste enamel, PAHs, PCBs, iron oxides, manganese, silicone, tin, mercury, paint waste, antimony, barium, cadmium, iron, nickel, zinc, hexavalent chromium, selenium, silver, ammonia nitrate, phenol, diethanolamine, xylol, ketone, isophorone, methyl ethyl ketone, nitric acid, chromic acid, methyl isobutyl ketone, sulphuric acid, chromate pigments, phosphoric acid, barium, cryolite-asbestos, potassium nitrate, lead oxide, sodium nitrate, solvents, ink, and 1,1,1-trichloroethane (see Table 1 in Appendix B for references).

In addition, a deposition from a truck driver that hauled waste for Robb Tyler from the 1950s to 1979 provides documentation of the existence of pits located at Source 5 for the disposal of sludges and paint wastes. According to this deposition, wastes generated from General Motors, Signode Steel, O'Brien Paint, and Thompson's Wire were disposed of into two pits located at Source 5. The deponent testified the size of the pits to be "two or three hundred yard around it" (Ref. 83, pp. 5, 9, 10, 15, 17, 18, 19, 21, 28, 29, 48, 64, 65, 66, 69).

Documentation that wastes containing hazardous substances were disposed of at Source 5 is also provided by laboratory analytical results. As detailed in the paragraphs below, samples were collected from drums and seeps encountered on Source 5, a pond located on Source 5, test pits excavated at the source, and from wetlands that remain at Source 5.

Laboratory analytical results are available from samples collected of the 55-gallon drums of waste dumped into a ravine located within the wetlands of Source 5. These drums contained large amounts of zinc (48.6%) (Ref. 41; Ref. 43). Analysis of a sample of the waste material revealed a zinc concentration of 486,000 ppm (Ref. 41). In addition, laboratory analysis of the contents of the drums determined the waste to be classified as hazardous because the concentrations of lead and cadmium exceeded EP Toxicity levels (Ref. 44). The unnamed tributary to Herring Run flows from north to south through this area (Ref. 20). A sample of this stream near this disposal area revealed a zinc concentration of 500 ppm in the stream (Ref. 41). Additional evidence of the hazardous substances released into the surrounding environment from this area of Source 5 is obtained from analytical results from monitoring wells. In 1981, four monitoring wells were installed by the MD Department of Health and Mental Hygiene. Ground water elevation readings indicated that ground water was flowing in a northeast direction, towards Herring Run. Analytical results from ground water samples collected from an upgradient background well revealed an average zinc concentration of 0.84 milligrams per liter (mg/L); an average cadmium concentration of 0.01 mg/L; and an average lead concentration of 0.31 mg/L. Results from ground water samples collected from a monitoring well installed in the drum disposal area indicated a zinc concentration of 1,015.0 mg/L; a cadmium concentration of 0.56 mg/L; and a lead concentration of 3.8 mg/L. The zone of ground water contamination from this area was determined to extend at least 100 feet downgradient towards Herring Run (Ref. 44).

On March 13, 1985 MD WMA collected a sample of the oil-like substance that was observed entering the unnamed tributary to Herring Run. The sample was analyzed for PCBs by the State of Maryland's Hazardous Waste Laboratory. Analytical results indicated a PCB concentration of 90,000 µg/kg. A second sample of the substance entering the stream was collected on April 16, 1985; the PCB concentration in this sample was 84,000 µg/kg. A third sample was collected from the soils in the embankment where the oil seep appeared to be originating from; this soil sample had a PCB concentration of 5,500 µg/kg (Ref. 15, pp. 3, 24, and 99; Ref. 47; Ref. 48; Ref. 53).

In 1989, MD WMA collected a sediment sample from the pit filled with tires that is located at Source 5 (Ref. 15, p. 4; Ref. 54, p. 5; Ref. 52, Vol. I, p. 111). Analytical results from this sample are shown in the table below.

Hazardous Substance	Evidence	Concentration (µg/kg)	SQL (µg/kg)	Reference
Phenanthrene	SED-4	1,100	660	52, Vol. I, pp. 66 and 111; Vol. II, p. 146; 79
Fluoranthene	SED-4	950	660	52, Vol. I, pp. 66 and 111; Vol. II, p. 146; 79
Pyrene	SED-4	1,100	660	52, Vol. I, pp. 66 and 111; Vol. II, p. 146; 79
Benzo(a)anthracene	SED-4	1,200	660	52, Vol. I, pp. 66 and 111; Vol. II, p. 146; 79
Chrysene	SED-4	1,400	660	52, Vol. I, pp. 66 and 111; Vol. II, p. 146; 79
Benzo(a)pyrene	SED-4	970	660	52, Vol. I, pp. 66 and 111; Vol. II, p. 146; 79
Benzo(k)fluoranthene	SED-4	2,800	660	52, Vol. I, pp. 66 and 111; Vol. II, p. 146; 79
Indeno(1,2,3-cd)pyrene	SED-4	810	660	52, Vol. I, pp. 66 and 111; Vol. II, p. 146; 79
Benzo(g,h,i)perylene	SED-4	790	660	52, Vol. I, pp. 66 and 111; Vol. II, p. 146; 79
Aroclor-1254	SED-4	5,100	3,200	52, Vol. I, pp. 66 and 111; Vol. II, p. 147; 79

Notes:
µg/kg Micrograms per kilogram
SQL Sample quantitation limit; SQL calculations provided in reference 79

Finally, analytical results from samples collected as part of the ESI conducted in 2000 by the EPA SATA team provides further documentation of the hazardous substances disposed of into the E2EM wetlands of Source 5. These samples were collected at Source 5 in locations documented by historical aerial photographs to have at one time been covered with wetland vegetation. These aerial photographs further document the disposal of wastes into these wetlands (Ref. 12, pp. 14 through 29; Ref. 81). No removal of waste has occurred from this source; therefore, the analytical results summarized in the table below document the hazardous substances present in the waste that was directly deposited into the wetlands of Source 5. Sampling locations are provided in Figure 3 in Appendix A. These samples were analyzed for organic and inorganic parameters using CLP laboratory protocols. The samples collected for organic analysis were analyzed for SVOCs, PCBs and pesticides. The samples analyzed for inorganic analysis were analyzed for total metals. The table below summarizes the hazardous substances detected at Source 5 during this sampling event. To identify metal concentrations exceeding background levels, the metal

concentrations detected at Source 5 were compared to the concentrations detected in soil sample CPBWSS-01A, which was collected outside the influence of the site (Ref. 7, p. 12). Only the analytical result for the sample with the highest concentration of each hazardous substance is provided in the table below, (for a complete list of all contaminated samples collected from Source 2, see Section 2.2, Source Characterization).

EPA SATA Team Sample Results - 2000

Hazardous Substance	Evidence	Concentration* (µg/kg)	SQL (µg/kg)	Reference
Organics				
Acenaphthene	UCLF-WS04B	10,000	2,426	7, p. 139; 79
Anthracene	UCLF-WS04B	11,000	2,426	7, p. 140; 79
Benzo(a)anthracene	UCLF-WS04B	18,000	2,426	7, p. 140; 79
Benzo(b)fluoranthene	UCLF-WS04B	11,000 +	2,426	7, p. 140; 79
Benzo(k)fluoranthene	UCLF-WS04B	6,800	2,426	7, p. 140; 79
Benzo(a)pyrene	UCLF-WS04B	17,000	2,426	7, p. 140; 79
Benzo(g,h,i)perylene	UCLF-WS04B	7,000	2,426	7, p. 140; 79
bis(2-Ethylhexyl)phthalate	UCLF-WS11B	440,000 +	67,808	7, p. 144; 79
Butylbenzylphthalate	UCLF-WS13B	77,000	15,277.8	7, p. 144; 79
Carbazole	UCLF-WS04B	2,700	2,426	7, p. 140; 79
4-Chlorophenyl-phenyl Ether	UCLF-WS04B	12,000	2,426	7, p. 140; 79
Chrysene	UCLF-WS04B	19,000	2,426	7, p. 140; 79
Dibenzofuran	UCLF-WS04B	9,700	2,426	7, p. 140; 79
Dibenz(a,h)anthracene	UCLF-WS04B	3,700	2,426	7, p. 140; 79
Di-n-butylphthalate	UCLF-WS10B	6,400 J (640)	6,470.6	7, p. 144; 79
Fluoranthene	UCLF-WS04B	38,000 +	12,132	7, p. 140; 79
Indeno(1,2,3-cd)-pyrene	UCLF-WS04B	7,500	2,426	7, p. 140; 79
2-Methylnaphthalene	UCLF-WS04B	4,100	2,426	7, p. 139; 79
Naphthalene	UCLF-WS09B	350,000	733	7, p. 141; 79
n-Nitroso-di-n-propylamine	UCLF-WS04B	25,000 +	12,132	7, p. 139; 79
Phenanthrene	UCLF-WS04B	50,000 +	971	7, p. 140; 79
Phenol	UCLF-WS02B	3,800	2,845	7, p. 139; 79
Pyrene	UCLF-WS04B	30,000 +	12,132	7, p. 140; 79
Aroclor-1242	UCLF-WS02B	1,600 J (160)	56.9	7, p. 145; 79
Aroclor-1254	UCLF-WS06C	1,400 J (140)	49.3	7, p. 146; 79

Hazardous Substance	Evidence	Concentration* (µg/kg)	SQL (µg/kg)	Reference
Aroclor-1260	UCLF-WS06B	6,500 +	846	7, p. 146; 79

Hazardous Substance	Evidence	Concentration (mg/kg)	Background Concentration (CPBWSS-01A)* (mg/kg)	SQL (mg/kg)	Reference
Metals					
Antimony	UCLF-WS14B	37.2	ND	25.3	7, pp. 12, 52, 87; 79
Arsenic	IELF-WS03C	51.6	4.3 L (7.48)	2.8	7, pp. 12, 55, 87; 79
Barium	UCLF-WS11B	3,290 +	118.0	54.1	7, pp. 12, 52, 87; 79
Beryllium	UCLF-WS06B	1.8	[0.76]	1.4	7, pp. 12, 51, 87; 79
Cadmium	UCLF-WS11B	9.6	ND	1.4	7, pp. 12, 52, 87; 79
Chromium	UCLF-WS06B	1,660	27	2.8	7, pp. 12, 51, 87; 79
Copper	UCLF-WS08B	5,240 J (4,295)	33.7	7.0	7, pp. 12, 51, 87; 79
Lead	UCLF-WS11B	4,720 J (3,277.8)	101	0.8	7, pp. 12, 52, 87; 79
Manganese	UCLF-WS05A	13,300 +	487	33.9	7, pp. 12, 50, 87; 79
Mercury	UCLF-WS09B	6.5	0.18	0.2	7, pp. 12, 51, 87; 79
Nickel	UCLF-WS08B	446	16.3	19.6	7, pp. 12, 51, 87; 79
Silver	UCLF-WS12B	10.8	ND	2.6	7, pp. 12, 52, 87; 79
Zinc	IELF-WS13B	5,200 K (3,467)	142	7.1	7, pp. 12, 52, 87; 79

Notes:

* All qualified data has been adjusted in accordance with EPA's fact sheet entitled "Using Qualified Data to Document an Observed Release and Observed Contamination" (Ref. 19). Where an adjustment is required, the adjusted value is shown in parenthesis.

µg/kg Micrograms per kilogram
mg/kg Milligrams per kilogram
ND Not detected above the SQL
SQL Sample quantitation limit; SQL calculations presented in reference 79

Analytical Data Qualifiers:

J Analyte present; reported value may not be accurate or precise
K Analyte present; reported value may be biased high
L Analyte present; reported value may be biased low
\+ Results reported from diluted sample

Although a large amount of the wetlands documented to have at one time existed at Source 5 have subsequently been filled in, wetland areas do remain. Documentation that hazardous waste was deposited directly into wetlands at Source 5 is documented by the laboratory analysis of samples collected from the wetlands that remain at Source 5. The table below summarizes the hazardous substances detected in wetlands located at Source 5. To identify metal concentrations exceeding background levels, the metal concentrations detected in these wetland samples were compared to the analytical results from a sediment sample collected from a wetland located outside the influence of the site. This sample was collected in a wetland area located along Herring Run, upstream of the 68th Street Dump site. The sample was collected by the EPA Region 3 START in February 2001 and was analyzed for the same parameters as the samples collected from Source 1 (TCL organics and TAL metals by an EPA CLP laboratory) (Ref. 65). All sampling locations are shown on Figure 3 in Appendix A.

EPA SATA Team Wetland Sample Results - 2000

Hazardous Substance	Evidence	Concentration* (µg/kg)	SQL (µg/kg)	Reference
Organics				
Fluoranthene	BRWT-SD06	1,700 J (170)	589.5	7, p. 221; 79
Phenanthrene	BRWT-SD06	800 J (80)	589.3	7, p. 223; 79
Pyrene	BRWT-SD06	1,400 J (140)	589.5	7, p. 221; 79
Benzo(a)anthracene	BRWT-SD06	780 J (78)	589.3	7, p. 221; 79
Chrysene	BRWT-SD06	1,100 J (110)	598.9	7, p. 221; 79
bis(2-Ethylhexyl)phthalate	BRWT-SD06	1,300 J (130)	589.3	7, p. 221; 79
Benzo(b)fluoranthene	BRWT-SD06	1,200 J (120)	598.9	7, p. 221; 79
Benzo(k)fluoranthene	BRWT-SD06	740 J (74)	589.3	7, p. 221; 79
Benzo(a)pyrene	BRWT-SD06	920 J (92)	589.3	7, p. 221; 79
alpha-Chlordane	BRWT-SD06	9.2 J (.92)	3.03	7, p. 225; 79
gamma-Chlordane	BRWT-SD06	8.4 J (.84)	3.03	7, p. 225; 79
	IELFWT-SD02	5.4	4.2	7, p. 224; 79

Hazardous Substance	Evidence	Concentration (mg/kg)	Background Concentration (SED-01) (mg/kg)	SQL (mg/kg)	Reference
Metals					
Chromium	IELFWT-SD02	76.5	21.6	5.29	7, p. 83; 65, p. 5; 79
Lead	IELFWT-SD02	204	49.8	1.59	7, p. 83; 65, p. 5; 79
	BRWT-SD06	154	49.8	1.2	7, p. 84; 65, p. 5; 79
Mercury	IELFWT-SD02	0.97 B	[0.12] K	0.26	7, p. 83; 65, p. 5; 79
Nickel	IELFWT-SD02	77.5	15.8	21.2	7, p. 83; 65, p. 5; 79
Zinc	IELFWT-SD02	726	75.1	10.6	7, p. 83; 65, p. 5; 79

Notes:

* All qualified data has been adjusted in accordance with EPA's fact sheet entitled "Using Qualified Data to Document an Observed Release and Observed Contamination" (Ref. 19). Where an adjustment is required, the adjusted value is shown in parenthesis.

µg/kg Micrograms per kilogram

mg/kg Milligrams per kilogram

ND Not detected above the SQL

SQL Sample quantitation limit; SQL calculations provided in reference 79

Analytical Data Qualifiers:

J Analyte present; reported value may not be accurate or precise

K Analyte present; reported value may be biased high

Chemical Analysis - Source 5

An observed release by chemical analysis can be documented by the analytical results for sediment samples collected by MDE from the unnamed tributary that flows through Source 5. The unnamed tributary originates on Source 5 therefore a sample collected from Redhouse Run during the MDE ESI is provided as a background sample. This sample was chosen to document background concentrations because it was collected by the same agency (MDE) using the same sampling protocols as the release samples; it was analyzed, like the release samples, using CLP protocols; and Redhouse Run is a similar size and flow as the unnamed tributary (Ref. 20; Ref. 9, p. 18; Ref. 52, p. 2).

- Background Sample - Sediment

Sample ID	Sample Location	Depth (inches)	Date	Reference
SED-4	Redhouse Run	Unknown	6/2/93 - 6/3/93	9, pp. 19, 153, 171

- Background Concentration - Sediment

Sample ID	Hazardous Substance	Sample Concentration (µg/kg)	SQL (µg/kg)	Reference
SED-4	Aroclor-1254	ND	46.5	9, pp.165, 345; 79
	Phenanthrene	ND	181.5	9, pp.153, 277; 79
	Benzo(k)fluoranthene	ND	181.5	9, pp.153, 277; 79
	Fluoranthene	ND	181.5	9, pp.153, 277; 79
	Pyrene	ND	181.5	9, pp.153, 277; 79

Notes:

µg/kg Micrograms per kilogram
ND Not detected above the contract-required detection limit
SQL Sample quantitation limit; calculation provided in reference 79

- Release Samples - Sediments

Sample ID	Sample Location	Depth (inches)	Date	Reference
SED-1	Tributary to Herring Run	Unknown	1/17/89 - 1/20/90	52, Vol. I, pp. 2, 13, 66, and 108
SED-2	Tributary to Herring Run	Unknown	1/17/89 - 1/20/90	52, Vol. I, pp. 2, 13, 66, and 108
SED-3	Tributary to Herring Run	Unknown	1/17/89 - 1/20/90	52, Vol. I, pp. 2, 13, 66, and 108

- Release Concentrations - Sediments

Sample ID	Hazardous Substance	Sample Concentration (µg/kg)	SQL (µg/kg)	Reference
SED-1	Aroclor-1254	1,400	571	52, Vol. I, p.66, Vol. II, p. 135; 79
SED-2	Aroclor-1254	470	320	52, Vol. I, p.66, Vol. II, p. 139; 79
SED-3	Phenanthrene	550	485	52, Vol. I, p.66, Vol. II, p. 142; 79
	Fluoranthene	820	485	52, Vol. I, p.66, Vol. II, p. 142; 79
	Pyrene	540	485	52, Vol. I, p.66, Vol. II, p. 142; 79
	Benzo(k)fluoranthene	580	485	52, Vol. I, p.66, Vol. II, p. 142; 79

Notes:
µg/kg Micrograms per kilogram
SQL Sample quantitation limit; calculation provided in reference 79

Attribution - Source 5

Available reports and aerial photographs document that Robb Tyler disposed of waste at Source 5 from the 1950s through early 1970 (Ref. 8, pp. 44 and 46; Ref. 12; Ref. 15, p. 6; Ref. 39; Ref. 40; Ref. 81). Prior to being landfilled, the majority of Source 5 was covered with E2EM wetlands (Ref. 81). As documented in the observed release section, wastes containing hazardous substances were disposed of at Source 5. The dump was uncontained, therefore hazardous substances in the waste material were able to migrate from the wetlands into the unnamed tributary and Herring Run. Documentation that this occurred is provided by the analytical results of samples collected from wetlands that remain at the source. In addition, laboratory analytical results from samples collected from drums, oil release seeps, and soils located at Source 5 document the presence of the same hazardous substances that were detected in the unnamed tributary and downstream release samples collected from Herring Run.

Hazardous Substances in the Release

Aroclor-1254
Benzo(k)fluoranthene
Fluoranthene
Phenanthrene
Pyrene

4.1.2.2 WASTE CHARACTERISTICS

4.1.2.2.1 Toxicity/Persistence

See Section 4.1.2.2 of the HRS Documentation Record for the toxicity/persistence table.

Highest Toxicity/Persistence Value = 10,000

4.1.2.2.2 Hazardous Waste Quantity

Source HWQ values assigned are summarized below.

Source No.	Source Name	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is Source Hazardous Constituent Quantity Data Complete? (Yes/No)
5	Industrial Enterprises/Unclaimed Landfill	77.6	No
	TOTAL	**77.6***	

Level II targets documented downstream of this source; therefore a HWQ factor value of 100 is assigned (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value (Ref. 1, Section 2.4.2.2) = 100

4.1.2.2.3 Waste Characteristics Factor Category Value

The waste characteristics factor value for the drinking water threat is calculated below, as specified in the HRS Final Rule Section 2.4.3.1 (Ref. 1):

Toxicity/Persistence Factor Value = 10,000
HWQ Factor Value = 100
Toxicity/Persistence Factor Value (10,000) × HWQ Factor Value (100) = 1×10^6

Waste Characteristics Factor Category Value (Ref. 1, Table 2-7) = 32

4.1.2.3 DRINKING WATER TARGETS

There are no drinking water intakes located within the 15-mile TDL; therefore, the drinking water threat was not scored (Ref. 67).

4.1.3.2 Waste Characteristics

4.1.3.2.1 Toxicity/Persistence/Bioaccumulation

See Section 4.1.2.2 of the HRS Documentation Record for the toxicity/persistence factor values, the human food chain bioaccumulation values, and the combined toxicity/persistence/bioaccumulation factor values for all hazardous substances detected at the five sources that comprise the 68th Street Dump site.

==========

Toxicity/Persistence/Bioaccumulation Factor Value = $5x10^8$

4.1.3.2.2 Hazardous Waste Quantity

Source HWQ values assigned are summarized below.

Source No.	Source Name	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is Source Hazardous Constituent Quantity Data Complete? (Yes/No)
5	Industrial Enterprises/Unclaimed Landfill	77.6	No
	TOTAL	**77.6***	

* Level II targets documented downstream of this source; therefore a HWQ factor value of 100 is assigned (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value = 100

4.1.3.2.3 Waste Characteristics Factor Category Value

The waste characteristics factor value for the human food chain threat is calculated below, as specified in the HRS Final Rule (Ref. 1, Section 4.1.3.2.3):

Toxicity/Persistence Factor Value = 10,000
HWQ Factor Value = 100
Bioaccumulation Potential Factor Value (BPFV) = $5x10^{8}$

Toxicity/Persistance Factor Value (10,000) × HWQ Value (100) = $1x10^{6}$
$1x10^{6}$ × BPFV ($5x10^{8}$) = Waste Characteristics Product ($5x10^{14}$) (subject to maximum value of $1x10^{12}$)

Waste Characteristics Factor Category Value (Ref. 1, Table 2-7) = 1,000

Waste Characteristics Factor Category Value = 1,000

4.1.3.3 HUMAN FOOD CHAIN THREAT-TARGETS

Actual Human Food Chain Contamination

Sediment Samples - Herring Run

Sediment samples collected from Herring Run that contained hazardous substances having a bioaccumulation potential factor value of 500 or greater and that meet the criteria for an observed release are presented below. Hazardous substances detected in sediment samples collected downstream of all five sources were also detected at each individual source; therefore the release of these hazardous substances is partially attributable to each of the sources identified at the 68th Street Dump site. All of these samples are documented in the observed release section, Section 4.1.2.1.1 for the overall site. The bioaccumulation potential factor values are documented in Section 4.1.3.2.1 of the documentation record of the entire site.

Sample ID	Downstream of Source No.	Hazardous Substance	Sample Concentration* (µg/kg)	Bioaccumulation Value
Organics				
BR-SD03	1,2,3,4,5	Benzo(a)anthracene	650	50,000
		Benzo(k)fluoranthene	620	50,000
		Benzo(a)pyrene	680	50,000
Sample ID		**Hazardous Substance**	**Sample Concentration (mg/kg)**	**Bioaccumulation Value**
Metals				
BR-SD04	1, 2, 3, 4, 5	Zinc	464 L	500
BR-SD06	1, 2, 3, 4, 5	Zinc	327	500

Notes:

* All qualified data has been adjusted in accordance with EPA's fact sheet entitled "Using Qualified Data to Document an Observed Release and Observed Contamination" (Ref. 19). Where an adjustment is required, the adjusted value is shown in parenthesis.

mg/kg Milligrams per kilogram

µg/kg Micrograms per kilogram

Analytical Data Qualifiers:

J Analyte present; reported value may not be accurate or precise

L Analyte present; reported value may be biased low

Closed Fisheries

No closed fisheries have been established within the 15-mile TDL.

Level I Concentrations

No Level I concentrations have been established.

Most Distant Level II Sample

Analysis of sediment sample BR-SD03 detected three hazardous substances (benzo(a)anthracene, benzo(k)fluoranthene, and benzo(a)pyrene) in Herring Run that were also detected in samples collected from Source 5.

Sample ID: BR-SD03
Distance from PPE_{5B}: 2,798 feet
Reference: Figures 2, 3, and 6 in Appendix A

Level II Fisheries

Hazardous substances that have bioaccumulation potential factor values of 500 or greater were detected in sediment samples collected from Herring Run. The extent of Level II fisheries that can be documented for Source 5 includes the distance from PPE_{5C} to sediment sampling location BR-SD03.

Identity of Fishery	Extent of the Level II Fishery
Herring Run	2,798 feet

4.1.3.3.1 Food Chain Individual

A food chain individual factor value of 45 is assigned for Source 5 because a portion of the Herring Run fishery is subject to Level II concentrations of hazardous substances that can be partially attributed to migration from Source 5 (Ref. 1).

Food Chain Individual Factor Value = 45

4.1.3.3.2 Population

4.1.3.3.2.1 Level I Concentrations

No Level I concentrations can be documented with the available data.

Level I Concentrations Factor Value = 0

4.1.3.3.2.2 Level II Concentrations

Herring Run is a fishery that has been documented to be subject to Level II concentrations of hazardous substances partially attributable to Source 5 of the 68th Street Dump site. The actual production value for Herring Run is unknown; therefore, the minimum production value is assigned for the area of actual contamination. The human food chain population value is based on HRS Final Rule Table 4-18 (Ref. 1).

Identity of Fishery	Annual Production (lbs)	References	Human Food Chain Population Value
Herring Run	> 0 to 100	9, p. 6; 16; 18; 68; 69; 70; 71; 72; and 76	0.03

Level II Concentrations Factor Value = 0.03

4.1.3.3.2.3 Potential Human Food Chain Contamination

The Back River and Chesapeake Bay are both designated fisheries located within the 15-mile downstream TDL (Ref. 16; Ref. 69; Ref. 70; Ref. 73). Production values for the Back River and the portion of the Chesapeake Bay within the 15-mile surface water TDL are not known, therefore, the potential for human food chain contamination is not scored and is assigned a contamination factor value of greater than 0.

Potential Human Food Chain Contamination Factor Value = >0

4.1.4 ENVIRONMENTAL THREAT

4.1.4.2 Waste Characteristics

4.1.4.2.1 Ecosystem Toxicity/Persistence/Bioaccumulation

See Section 4.1.4.2.1 of the HRS Documentation Record for the ecosystem toxicity/persistence factor values, the environmental bioaccumulation values and the ecosystem toxicity/persistence/bioaccumulation factor values for Source 5. The factor values were assigned from HRS Final Rule Tables 4-20 and 4-21 (Ref. 1).

4.1.4.2.2 Hazardous Waste Quantity

Source HWQ values assigned are summarized below.

Source No.	Source Name	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is Source Hazardous Constituent Quantity Data Complete? (Yes/No)
5	Industrial Enterprises/Unclaimed Landfill	77.6	No
	TOTAL	**77.6***	

* Level II targets documented downstream of this source; therefore a HWQ factor value of 100 is assigned (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value = 100

4.1.4.2.3 Waste Characteristics Factor Category Value

The factor value for the environmental threat is calculated as specified in the HRS Final Rule (Ref. 1). The calculations are presented below.

Ecosystem Toxicity/Persistence Value = 10,000
Ecosystem Bioaccumulation Potential Factor Value = 50,000
HWQ Factor Value = 100
Ecosystem Toxicity/Persistence x HWQ = $1x10^6$

(Ecosystem Toxicity/Persistence x HWQ) x
(Ecosystem Bioaccumulation Potential Factor Value) = $1x10^6 \times 50{,}000 = 5x10^{10}$

Waste Characteristics Factor Category Value = 320

4.1.4.3 Environmental Threat-Targets

- Level I Concentrations

No Level I concentrations of sensitive environments have been documented within the 15-mile downstream TDL.

Most Distant Level II Sample

Sediment sample BR-SD03 was collected in Herring Run. Wetlands are present at this location here that run contiguous to Herring Run (Ref. 81). Hazardous substances (benzo(a)anthracene, benzo(k)fluoranthene and benzo(a)pyrene) were detected in this sample that were also detected in samples collected from the five sources identified at the 68th Street Dump site.

Sample ID: BR-SD02
Distance from PPE_{5C}: 2,798 feet
Reference: Figures 2 and 3 in Appendix A

4.1.4.3.1 Sensitive Environments

4.1.4.3.1.2 Level II Concentrations

Sensitive Environments

No listed sensitive environments subject to Level II concentrations have been documented within the 15-mile downstream TDL.

Total Length of Wetlands - Source 5

The PPE of hazardous substances from Source 5 into surface waters is into the wetlands documented to have covered the majority of Source 5 prior to landfilling. The total length of wetlands documented at Source 5 subject to Level II concentrations of hazardous substances is determined by measuring the total perimeter of historical wetlands documented at Source 5 (Ref. 81, Figure 3). This length, as calculated by the ArcView GIS 3.2 computer program, is 1.37 miles. The assigned HRS wetland rating for Source 5is 50 (Ref. 1, Table 4-24; Ref. 23; Ref. 81, Figure 3).

4.1.4.3.1.3 Potential Contamination

The Chesapeake Bay is documented as habitat used by threatened species within the 15-mile surface water TDL (Ref. 75). The Chesapeake Bay is coastal tidal waters, therefore the assigned dilution weight of 0.0001 is assigned from the HRS Final Rule, Table 4-13 (Ref. 1).

Chesapeake Bay:

Sensitive Environment	Distance from Probable Point of Entry to Nearest Point of Sensitive Environment	Reference	Sensitive Environment Values
Habitat known to be used by Federal designated or proposed endangered or threatened species:			
Bald Eagle (*Haliaeetus leucocephalus*)	0	75	75
Peregrine Falcon (*falco percyrmus*)	0	75	75

TOTAL: 150

Wetlands

Wetlands not counted as Level II targets occur along the Back River and Chesapeake Bay within the 15-mile downstream TDL. The length of these wetlands are provided below.

Back River

The total length of wetlands subject to potential contamination located along Back River within the TDL is 4.5 miles; therefore the assigned value is 150 (see Figure 6 in Appendix A) (Ref. 1, Table 4-24; Ref. 17).

Chesapeake Bay

The total length of wetlands subject to potential contamination located downstream along the Chesapeake Bay within the TDL is 13.6 miles, therefore the wetlands assigned value is 350 (see Figure 6 in Appendix A) (Ref. 1, Table 4-24; Ref. 17).

Potential Contamination Factor Value

The potential contamination factor value (SP) is calculated as follows:

$$SP = \frac{(W + S)\ D}{10}$$

W = Value assigned for wetlands from HRS Table 4-24.
S = Value assigned for the sensitive environment from HRS Table 4-23.
D = Dilution weight assigned from HRS Table 4-13. Back River and Chesapeake Bay are coastal tidal waters (Ref. 17).

$$SP_{Back\ River} = \frac{(150 + 0)\ .0001}{10} = 0.0015$$

$$SP_{Chesapeake\ Bay} = \frac{(350 + 150)\ .0001}{10} = 0.005$$

$$SP_{Total} = 0.0015 + 0.005 = 0.0065$$

Potential Contamination Factor Value (SP) = 0.0065